THE NEM REPORT CARD

HOW WELL DOES THE NATIONAL ELECTRICITY MARKET SERVE AUSTRALIA?

TOTAL ENVIRONMENT CENTRE INC

Institute for Sustainable Futures

UNIVERSITY OF TECHNOLOGY SYDNEY

MONASH University

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DISCLAIMER

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The NEM Report Card: How well does the National Electricity Market serve Australia?

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EXECUTIVE SUMMARY

WHY A NEM REPORT CARD?

Reliable, affordable electricity supply is a key foundation of the prosperity and quality of life enjoyed in modern developed nations. Recognising the importance of electricity, Australian federal and state governments have over the past two decades created the National Electricity Market (NEM) with the stated objectives of developing and operating electricity supply infrastructure to facilitate low-cost, safe, reliable and efficient electricity supply. The objective of the NEM is explicitly stated in the National Electricity Law as the "National Electricity Objective" (or "NEO"):

> **s. 7—National electricity objective**
> The objective of this Law is to promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity with respect to—
> (a) price, quality, safety, reliability and security of supply of electricity; and
> (b) the reliability, safety and security of the national electricity system.

Having such an explicit objective invites the question of how well this objective is being met. However, this simple question is surprisingly difficult to answer for three reasons. Firstly, the objective is not clearly defined. The limited set of criteria included in the NEO creates potential conflicts both with other relevant criteria which are excluded and with the broader "long term interests of consumers". Secondly, there is very limited reliable and consistent data available across the range of criteria to measure the NEM's performance in pursuit of its objective. Thirdly, the NEO sits within a broader set of Australian energy policy objectives that impact on the electricity sector, through policies and measures that are 'external' the NEO and the National Electricity Market (see Section 3.2.2).

This raises the question of whether it is efficient and effective for the "interests of consumers" to be so divided between included and excluded criteria, and for the aims of the electricity market to be split between internal and external drivers.

This report seeks to assess how well the National Electricity Market serves the long term interests of Australian consumers by considering in detail these two issues:

- What does "the long term interests of consumers" mean?
- How well is the National Electricity Market performing when measured against a series of criteria that might reasonably be applied to the National Electricity Objective?

Drawing on this analysis, the report offers some observations on how the NEM and the NEO might be reformed to serve better the long term interests of consumers.

As this is the first time that such comprehensive assessment of the performance of the NEM against its objective has been attempted, there are likely to be some limitations. There are three particular limitations that should be highlighted. The first is that, consistent with Australia's liberal democratic traditions, consumers themselves are considered to be the best judges of what constitutes "the long term interests of consumers". While it is of course possible to survey a sample of consumers' views directly on this matter, it was beyond the scope of this project to do so. Instead, we used the more limited approach of surveying the views of consumer representative and advocacy organisations.

The second major limitation is as noted above, that data available to assess the performance of the NEM is far from complete and reliable. In some cases, no appropriate data could be found to assess performance against key criteria. In other cases, there was a lack of consistent time series data to assess trends, or a lack of comparable international data against which to benchmark Australia's performance. While the report seeks to provide robust indicators wherever possible, for the criteria of quality and safety, the data was either unavailable or insufficient and as such no grade is given.

The third major limitation was that, due to both the absence of relevant data and the absence of suitable precedents, it was necessary to apply a degree of judgement in converting the collected data into specific "grades" for each performance criterion. While the authors have sought to do this as objectively and transparently as possible, it should be noted that the grades given in this NEM Report Card are not a definitive statement of fact, but simply the best assessment of performance based on the available evidence.

Recognising these limitations, the NEM Report Card is intended not as a critique of the NEM or its institutions, but as a tool to understand where greater attention or effort may be required in order to improve performance.

It should be noted that these limitations are not intrinsic to the Report Card process. With more time and resources to collect data directly from market participants and stakeholders, as well as more complete and consistent reporting in the NEM, each of these limitations could be overcome in future performance assessments.

NATIONAL ELECTRICITY OBJECTIVE AND THE INTERESTS OF CONSUMERS

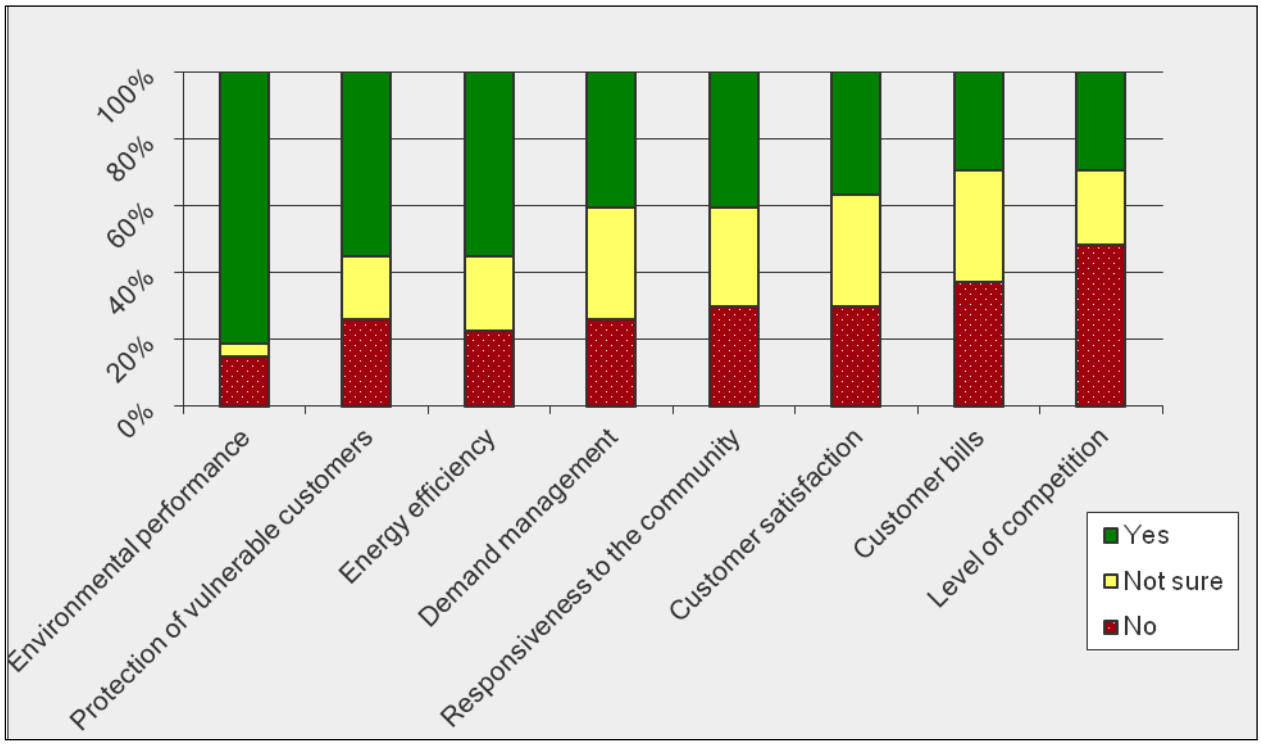
Before assessing the performance of the NEM against its objective, it is necessary to define specifically what "the long term interests of consumers" means. As noted above, the National Electricity Objective is directed towards "the long term interests of consumers of electricity with respect to — (a) price, quality, safety, reliability and security of supply of electricity..."

The choice of which criteria should be included in the NEO has been contentious since the establishment of the NEM. Other criteria have had both explicit and implicit elements of electricity market objectives in the Australian predecessors to the NEM and in overseas electricity markets. In order not to prejudge what consumers consider to be in their interests, this research sought to explore views about both the existing criteria and possible additional criteria that could be included in the NEO.

A range of representatives of consumer organisations, as well as other key stakeholders were surveyed as to how they perceived the long term interests of consumers.

There was strong agreement that those criteria already included in NEO – price, quality, safety, reliability and security of supply – are important elements of consumers' interests. However, there were also a number or other criteria that stakeholders, and in particular consumer representatives, believed were also important to consumers' interests. These included environmental performance, protection of vulnerable consumers, energy efficiency and demand management. While not formally incorporated into the NEO, these all fall, at least to some extent within the formal Australian energy policy objectives outlined in the 2011 Draft Energy White Paper.[1] This report therefore highlights the potential value of incorporating these objectives into the NEO. The results of this survey are summarised in Figure 1.

Figure 1: Which other criteria should be in the NEO? (Survey results, all stakeholders)

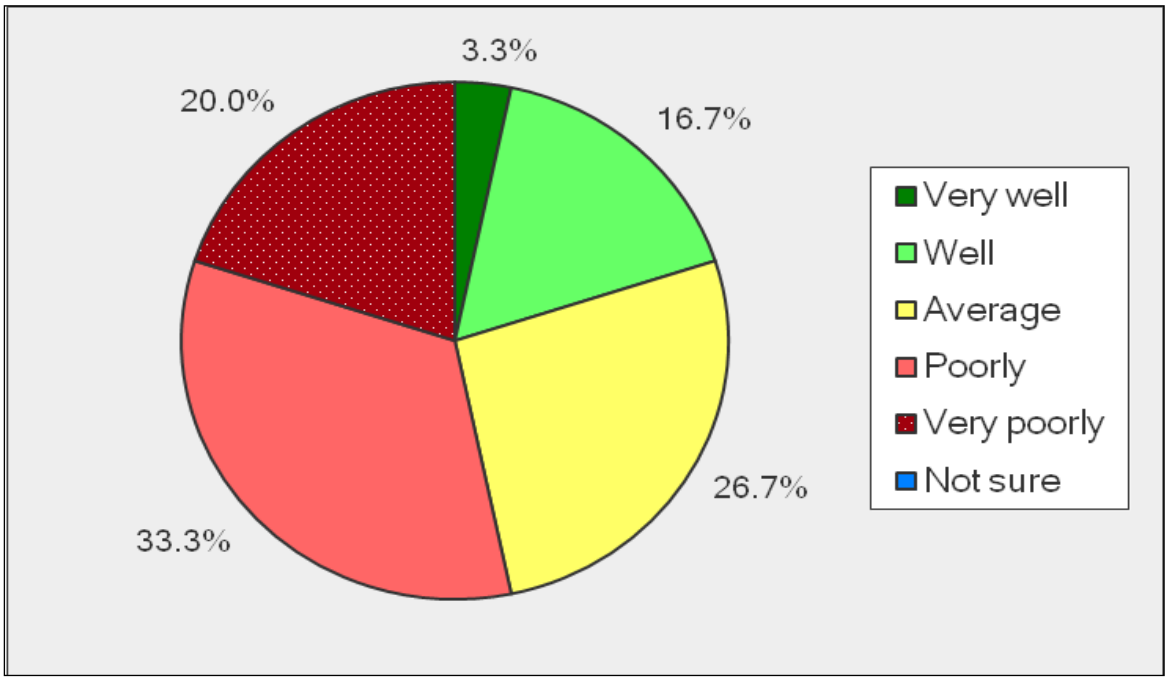


The NEM Report Card draws on both the existing criteria and these additional possible criteria in assessing the performance of the NEM.

PERFORMANCE OF THE NATIONAL ELECTRICITY MARKET

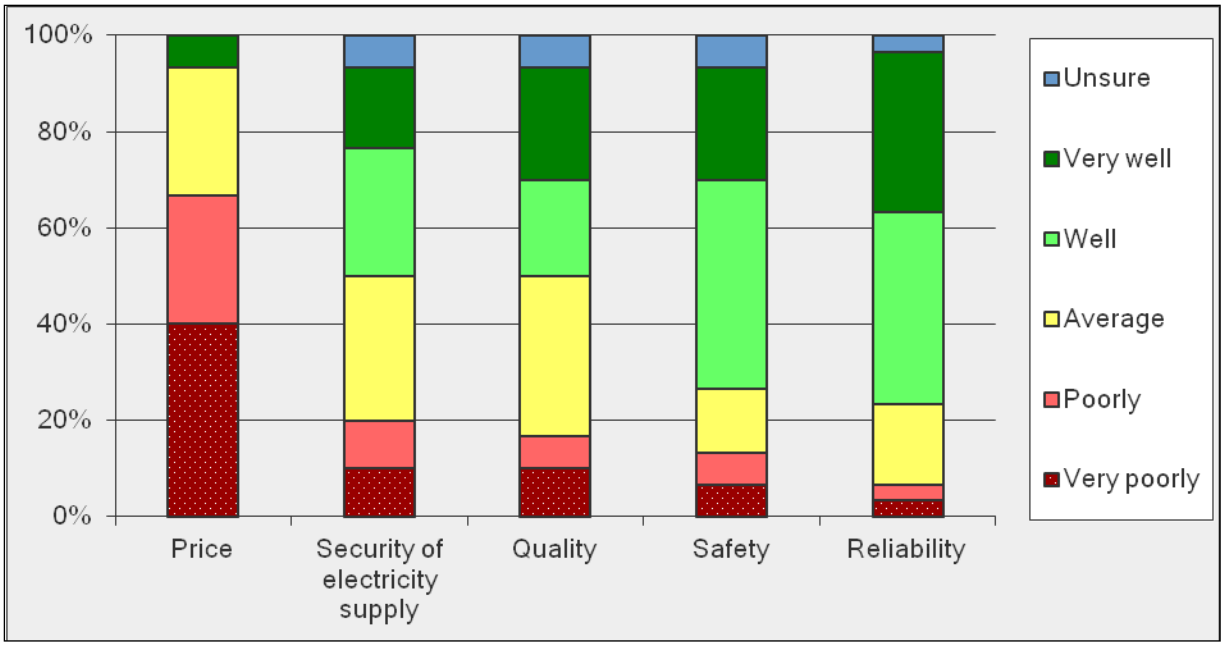
This Report explores the performance of the NEM from a number of perspectives. The simplest of these was to ask stakeholders how well they thought the NEM was performing in meeting its objective as currently defined in the National Electricity Law. Just over half of survey respondents (53%) stated that the NEM was performing poorly or very poorly, as illustrated in Figure 2.

Figure 2: How well is the NEM meeting its objective? (Survey response)



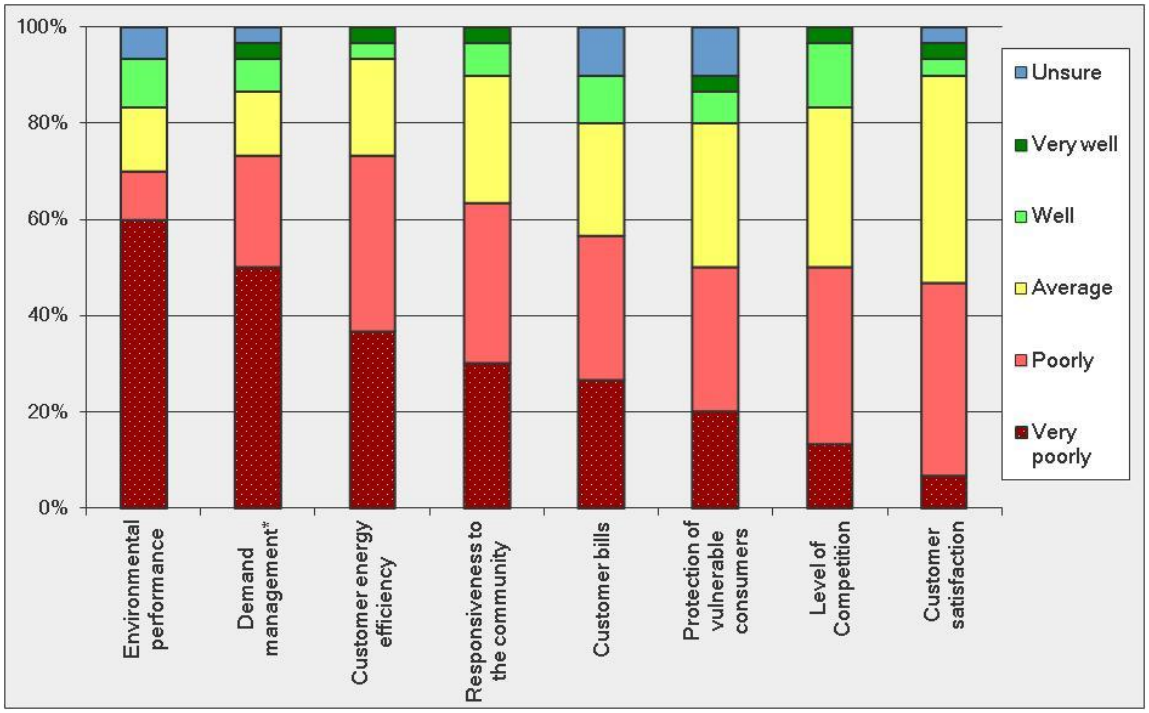
In order to understand the basis for stakeholders' views of the NEM, a series of additional questions was posed. For example, stakeholders were asked how well they thought the NEM was performing in relation to the existing criteria of the National Electricity Objective. In relation to four of the five criteria, the NEM was generally seen to be performing well or very well (see Figure 3). Only in the area of price were strongly negative views dominant.

Figure 3: How well is the NEM meeting the existing criteria of the NEO?



Stakeholders were also asked how well they thought the NEM was performing in relation to the other possible criteria that could be included in the National Electricity Objective. As these criteria are currently excluded, it is not surprising that the NEM was seen as not performing as well in these areas (see Figure 4). The NEM was seen to be particularly weak in relation to environmental performance, demand management and customer energy efficiency.

Figure 4: How well is the NEM meeting other possible criteria for the NEO?



The research project then sought to gather data to compare these subjective stakeholder perspectives with objective quantitative data on the performance of the NEM for both existing criteria for the NEO and potential additional criteria.

For each priority criterion, one or more Key Performance Indicators were identified and data was sought for each. Benchmarks of performance were established and a "grade" was given in reference to these benchmarks. Wherever possible, international benchmarks of performance were used. Where this was not possible, the performance was benchmarked against historical trends within Australia or the NEM.

The outcomes of this detailed analysis are summarised in the National Electricity Market Report Card below. In general the results of this data analysis and grading correspond quite closely to the results of the stakeholder survey (see Table 1). However, there were some notable exceptions. In the case of prices, the NEM was rated by most stakeholders as performing poorly or very poorly. However when measured against the international benchmarks and recent trends, the NEM received a Fair or "C" grade. Similarly, over 50% of the surveyed stakeholders gave the NEM a poor or very poor rating for customer bills, while the Report Card ranked it as a creditable "B".

Table 1: NEM Performance Ranking – Stakeholder Survey versus Report Card

Current NEO Criteria	Stakeholder Survey Grade	Report Card Grade
Reliability	B	**B**
Security of Supply	C	**C**
Quality	C	**Ungraded**
Safety	B	**Ungraded**
Price	D	**C**
Possible New NEO Criteria		
Customer bills	D	**B**
Environmental performance	D	**F**
Energy efficiency	D	**D**
Demand management	D	**D**
Protection of vulnerable consumers	D	**C**
Customer satisfaction	C	**C**
Level of Competition	C	**B**

Overall, both on the basis of the limited data currently available and stakeholder perspectives, it appears that the NEM is doing a fair to good job of serving those elements of the "long term interests of the consumer" that are currently included in the NEO. However, for criteria that are not currently included in National Electricity Objective, with the exception of Customer Bills and Level of Competition, the performance of the NEM ranges from fair to very poor.

The National Electricity Market Report Card – 2011

	CRITERIA	GRADE	KEY PERFORMANCE INDICATOR
Criteria included in the NEO	Reliability	B	System Average Interruption Duration Index (SAIDI)
			Reliability Unserved Energy (USE)
	Security	C	Estimated Security Unserved Energy (USE)
	Quality	Ungraded	Customer Severity Index (CSI)
	Safety	Ungraded	Lost time injury frequency
	Price	C	Retail price of electricity for residential customers (c/kWh)
			Retail price of electricity for small business customers (c/kWh)
Criteria excluded from the NEO	Customer bills	B	Average annual residential customers electricity bill as a proportion of household expenditure
	Environmental performance	F	Annual greenhouse gas emissions from the electricity sector (tonnes CO_2e/year)
			Greenhouse gas intensity of electricity supply (kg CO_2e/MWh)
			Renewable energy as a proportion of total electricity generation (% of total MWh)
	Energy efficiency	D	Electricity savings from energy efficiency programs as % of total electricity consumed (% of total MWh)
	Demand management	D	Proportion of peak demand met through demand management programs (% of total MW peak)
	Protection of vulnerable customers	C	Number of disconnections of residential customers on payment plans and pensions
			Number of households that are 'energy poor' (electricity costs > 10% of household budget)
	Customer satisfaction	C	Number of complaints per year
			Surveyed customer satisfaction
	Level of competition	B	Extent of generation market concentration
			Extent of retail market concentration

KEY: A= Very good; B= Good; C= Fair; D= Poor; F= Very Poor; Ungraded= insufficient data

CONCLUSIONS AND RECOMMENDATIONS

Based on the analysis for this Report Card, a number of conclusions can be drawn and three recommendations are offered.

The first conclusion is that there is quite limited publicly available data on the performance of the NEM in relation to the long term interest of consumers. This is the case for the existing and possible additional criteria included in the National Electricity Objective. Whichever criteria are included in the objective of the National Electricity Market, it is crucial that more relevant, reliable and consistent data be collected and reported. It is therefore recommended that more comprehensive reporting be undertaken with regards to NEM performance.

Recommendation 1: That the Standing Council on Energy and Resources requires annual public performance reporting of the National Electricity Market against the criteria of the National Electricity Objective.

Ideally, this should include annual reporting of specific quantitative and qualitative Key Performance Indicators against performance benchmarks relevant to the long term interest of electricity consumers, as presented in this Report Card. This reporting could be included in the AER's annual State of the Energy Market Report. Such annual reporting would highlight where the NEM is performing well and help to identify potential areas for improvement.

As noted above, the lack of data relates to both criteria currently included in the NEO and criteria excluded from the NEO. However, while supply side reporting is deficient, (particularly for Safety, Quality and Security) there is a pronounced lack of information available on the demand side of the market (particularly for Energy Poverty, Energy Efficiency, Demand Management and Customer Satisfaction). This shortcoming should be addressed even if there is no change to the current National Electricity Objective.

Recommendation 2: That public reporting on the performance of the NEM should be extended for the consumer side of the market, particularly in relation to customer bills, customer energy efficiency, demand management, protection of vulnerable customers and customer satisfaction.

The second conclusion is that if consumers' interests are to be well served by the NEM, then it is important to reflect the views of the consumers themselves as to what their interests are.

In the most recent round of reforms of the National Electricity Market, social and environmental objectives were deliberately excluded. Research for this report indicates

that consumer advocates clearly identify that the social and environmental impacts of the NEM affect the long term interest of consumers. The Report Card results suggest that the current policy of seeking to achieve social and environmental outcomes in the electricity sector only through policies external to the NEM and the NEO has not delivered very good results either in practice or according to stakeholders perception, and may even have adversely impacted on some consumer interest criteria *within* the NEO, such as price. Given that all decisions in the NEM are considered against the NEO, there is likely to be significant benefit in incorporating environmental and social criteria for the long term interest of consumers into the NEO. International precedents for the inclusion of social and environmental consideration into the formal objectives of the electricity markets can be found in the US, Canada and the UK.

Recommendation 3: That the National Electricity Objective should be amended to incorporate social and environmental criteria for the long term interest of consumers in addition to the existing technical and price criteria.

This Report Card has found that the NEM is not performing well against a series of social and environmental criteria, such as customer satisfaction, protection of vulnerable consumers, greenhouse gas emissions (both total emissions and emissions intensity per unit of energy generated), demand management, energy efficiency and renewable energy. Including the full range of criteria for the long term interests of consumers, would make the implicit trade-offs that are already being made more transparent within the decision making processes of the NEM.

While the inclusion of social and environmental criteria within the NEO would probably not lead to immediate changes in the operation or performance of the NEM, their inclusion would be likely to lead to consideration of policy and rule changes where appropriate and greater attention by NEM institutions to addressing poor performance in these areas.

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GLOSSARY

ABS	Australian Bureau of Statistics
ACCC	Australian Competition and Consumer Commission
AEM	Australian Energy Market
AEMA	Australian Energy Market Agreement
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
CAIDI	Customer Average Interruption Duration Index
CEER	Council of European Energy Regulators
CO_2-e	Carbon dioxide equivalent
COAG	Council of Australian Governments
CPUC	California Public Utilities Commission
CR(n)	Concentration Ratio
DE	Distributed Energy
DCCEE	Department of Climate Change and Energy Efficiency
DECC	Department of Energy and Climate Change (UK)
DM	Demand management
DNSP	Distribution Network Service Provider
DSP	Demand Side Participation
EE	Energy efficiency
EEO	Energy Efficiency Opportunities Program
EIA	Energy Information Administration (US)
ERIG	Energy Reform Implementation Group
ESAA	Energy Supply Association of Australia
ESD	Ecologically Sustainable Development
FE	Frontier Economics
FRC	Full Retail Contestability
GHG	Greenhouse gas
GWh	Gigawatt hour
HHI	Herfindahl-Hirschman Index
HV	High voltage
IEA	International Energy Agency
IPART	Independent Pricing and Regulatory Tribunal
KPI	Key Performance Indicator
LV	Low Voltage
MAIFI	Momentary Average Interruption Frequency Index
MCE	Ministerial Council on Energy

MEPS	Minimum Energy Performance Standards
Mt	Megatonnes
MV	Medium Voltage
MW	Megawatt
MWh	Megawatt hour
NEC	National Electricity Code
NECF	National Energy Customer Framework
NEL	National Electricity Law
NEM	National Electricity Market
NEMMCO	National Electricity Market Management Company
NEO	National Electricity Objective
NER	National Electricity Rules
NERC	North American Electric Reliability Corporation
NGMC	National Grid Management Council
NGP	National Grid Protocol
NSP	Network Service Provider
OECD	Organisation for Economic Co-operation and Development
OTTER	Office of the Tasmanian Economic Regulator
PPS	Purchasing Power Standard
PSI	Pivotal Supplier Index
RE	Renewable Energy
RERT	Reliability and Emergency Reserve Trader
RSI	Residual Supply Index
SAIDI	System Average Interruption Duration Index
SOO	Statement of Opportunities
TNSP	Transmission Network Service Provider
USE	Unserved Energy
VCR	Value of Customer Reliability
WEC	World Energy Council

0. INTRODUCTION

From its beginning as a state-based regulated monopoly model of electricity supply common around the world until the late 1980s, the Australian electricity market has been extensively restructured and transformed over the past two decades. National competition policy developed and adopted in the mid 1990s supported the move towards a national electricity market. Following the creation of the *National Electricity Market* (NEM) in 1998, the *Australian Energy Market* (AEM) was formally established in 2004. New national market institutions were introduced – the Australian Energy Market Commission (AEMC), the Australian Energy Regulator (AER) and the Australian Energy Market Operator (AEMO) – and important energy market roles were divided between the existing and new bodies. These changes resulted in the separation of policy making, rule making, energy market development, economic regulation and market rule enforcement. New laws, regulations and rules have been introduced that form the federal legislative framework supporting the establishment of the AER, the NEM, and other bodies responsible for the development, operation, and regulation of the energy market. Non-economic distribution and retail functions are currently being transferred into the national framework, with the *National Retail Law 2011* representing another important stage in the creation of a truly national energy market.

The intended status of consumers as the primary beneficiaries of the NEM is formalised in the current national electricity market objective (the NEM objective or NEO):

> *To promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity with respect to –*
> *a. price, quality, safety, reliability, and security of supply of electricity; and*
> *b. the reliability, safety and security of the national electricity system.*

The NEM objective, provided for in section 7 of the *National Electricity Law* (the NEL), came into force in 2005. To the casual observer, the NEM objective clearly spells out five key factors or criteria affecting consumers' long term interests – price, quality, safety, reliability and security of supply, and the integrity the electricity system itself – and the means by which these goals are to be achieved, namely efficient investment and use. This represents a marked shift away from the previous multiple market objectives set out in the *National Electricity Code 1998* (NEC) and before that in the *National Grid Protocol* ('NGP objectives'), *1992*. Whilst the NGP objectives incorporated the key global and domestic environmental concerns of that time – climate change and greenhouse gas emissions – the NEC objectives directly reflected the national competition policy principles underpinning the establishment of the NEM in 1998.

The broader impact of the NEM objective is evident in the functions of the key market institutions that are responsible for the functioning and oversight of the NEM. The AEMC, the AER and the AEMO are all required to take account of the NEM objective in the exercise of their various functions. Whilst these key market institutions are also required to report on many aspects of their roles in the NEM, this public accountability function does not appear to extend to a specific, regular and direct assessment of NEM performance against the NEM objective. In other words, there is no explicit and detailed reporting on whether the NEM is working in the long term interests of electricity consumers.

The shift to the current single NEO has major ramifications for electricity market stakeholders and consumers. Important questions include whether the NEO is indeed being achieved within the NEM's current governance, regulatory and legislative framework and whether the current NEO suitably reflects the long term interests of consumers, as perceived by consumers (and other market stakeholders).

0.1 PROJECT PURPOSE AND OUTCOMES

This research project was initiated by the Total Environment Centre (TEC) in response to the extensive and ongoing reforms of the National Electricity Market, which currently include the transition of non-economic distribution and retail functions into the national sphere. As such, the key outcome of this research project is a Report Card on the NEM, which assesses, as far as possible, the extent to which the NEM is meeting the long term interests of consumers. This research project set out to answer the following questions:

> *What are the long term interests of consumers – as viewed by consumers and other market stakeholders? Do these accord with the interests set out in the NEM objective?*
>
> *Is the NEM working in the long term interests of consumers?*
>
> *Who is responsible for ensuring that the NEM is meeting the long term interests of consumers?*
>
> *How could the NEM's performance be improved both against the current stated objective and against what consumers and other market stakeholders consider to be the long term interests of consumers?*

The main outputs of this research are a NEM Report Card (Section 4) and a series of recommendations for addressing the long term interests of consumers within the NEM (Section 5). The purpose of the Report Card is to communicate clearly and concisely how well the NEM is operating in the long term interests of consumers. As such, a significant

focus of this report is on identifying indicators that appropriate for judging the long term consumer interests within the NEM. The choice of performance measures can have a powerful impact on the behaviour of institutions. As author Donella Meadows observed, "indicators arise from values (we measure what we care about) and they create values (we care about what we measure).[2]

0.2 METHODOLOGY OVERVIEW

The NEM Report Card grades a series of criteria for assessing the long term interest of consumers. Key performance indicators (KPIs) associated with each criterion provide the basis for the grade. The following seven-part methodology was employed to gather the information and data necessary to develop the NEM Report Card.

1. An initial literature review of Australian and international industry reports, academic articles and inquiry submissions was undertaken to identify the views of stakeholders on the objective and the performance of the NEM.

2. From the literature review, 13 possible criteria and 48 associated KPIs for the long term interests of consumers were identified.

3. A stakeholder survey was then developed and sent to 59 organisations to gauge:
    a) What they think are the long term interests of electricity consumers;
    b) What they believe to be the best KPIs to measure the performance of the NEM with respect to those long term interests;
    c) The adequacy of the current National Electricity Objective; and
    d) How well they think the NEM is performing with respect to the current objective.

4. Criteria and associated KPIs were then prioritised based on the literature review and survey results, to finalise which criteria should be included in the Report Card.

5. Data was sought and a method for scoring each KPI was developed.

6. Appropriate benchmarking measures for each KPI were identified and a corresponding grade assigned.

7. The grades for each KPI were averaged to provide an overall grade for each criterion for the long term interests of consumers. These grades were then collated into a Report Card (Section 3.2).

A detailed outline of the methodology is provided in Appendix A.

The literature that was reviewed in the preparation of this report included background material related to the reforms in the Australian Energy Market, the establishment of the NEM and specific discussions on the long term interests of electricity consumers. This review included an examination of relevant published reports and unpublished documents and investigated different market participants' opinions relating to the objectives of the NEM and the long term interests of consumers. The materials obtained through the literature and document review were then considered within the context of the governance, regulatory and legislative regime underpinning the NEM and the development of a single market objective. The existing NEM objective was compared and contrasted with its predecessors, and strengths and weaknesses are highlighted throughout the discussion.

0.3 STRUCTURE OF THE REPORT

This Report consists of five main parts, some of which contain several sections. Parts 2 to 5 relate directly to the four research questions outlined above.

Part 1 sets out the **background** for this Report including a history and overview of the NEM and the changing nature of the market objective.

Part 2 outlines the **key organisations** within the NEM and discusses their responsibilities with respect to the current NEO and the broader long term interests of consumers.

Part 3 addresses the question: **What are the long term interests of consumers?** To do so, the results of the stakeholder consultation regarding the long term interests of consumers and the NEO are set out. An appraisal of the NEO policy and of regulatory and legislative issues is also provided. Additionally, the NEO is compared with international examples.

Part 4 consists of five sections responding to the question: **Is the NEM operating in the long term interests of consumers?** To do this an overview of the KPIs and criteria included in the Report Card is given in Section 4.1. The NEM Report Card is set out in Section 4.2. Section 4.3 outlines and grades the KPIs used in the Report Card. These are ordered into different categories or criteria for the long term interest of electricity consumer. Section 4.4 provides survey respondents' views on NEM performance and compares these to the Report Card results. Section 4.5 discusses the implications of the KPI scoring process and outcomes. The specific methodology for this part of the research project is set out in Appendix A at the end of the Report.

Part 5 concludes the report by setting out **key recommendations** arising from this research project.

1. HISTORY OF THE NEM AND THE NATIONAL ELECTRICITY OBECTIVE

Energy market reform has been a key feature of successive Australian governments' policy decision-making and legislative functions for several decades. Since the early 1990s, extensive restructuring of the electricity sector has been accompanied by ongoing reform of the NEM's legislative, governance and regulatory framework. These changes have been discussed and analysed by a multitude of public and private stakeholders and independent commentators. It is not the purpose of this research project to engage in an in-depth study of the considerable dialogue on energy market reforms to date, but this part of the Report briefly examines key NEM reforms and developments, both past and present. The rationale for including this background information is twofold. First, the reforms to date have impacted widely upon the rights and/or responsibilities of key decision makers and the various market stakeholders, especially consumers. The introduction of several new key bodies, for instance, has altered the governance and regulatory framework of the NEM. Secondly, it is important that the information and data obtained through this project is interpreted in the context of an understanding of the historical reforms and their ramifications for the NEM and its various participants.

1.1. MOVING TO A COMPETITIVE NATIONAL ELECTRICITY MARKET

A great deal of the NEM's present characteristics can be traced back to the micro- and macro-economic reforms of the past three decades.[3] Indeed, the current NEM is vastly different from the vertically integrated, state-owned monopoly utilities of the 1970s.[4] Key features of the national energy market reform agenda emerged during the 1980s and 1990s. These included the introduction of competition into the electricity market, disaggregation of the electricity sector and its assets, and the establishment of a uniform, single wholesale electricity market in eastern and southern Australia.[5]

Since the introduction of the *National Competition Principles* in 1995, competition policy has been a key driver of reforms in the electricity sector.[6] The introduction of competition principles at each stage of the electricity transaction – generation, transmission, distribution, retail and end-use/consumption – occurred in several ways including: (i) linking previously independent state and territory electricity markets into an interconnected, single competitive wholesale market; (ii) pooling generated electricity and trading it across the participating jurisdictions; (iii) facilitating full contestability across the market by allowing customers to choose their own supplier (including generators and retailers); and (iv) ensuring – through legislation – non-discriminatory access to the interconnected transmission and/or distribution network.[7]

1.1.1. COMPETITIVE WHOLESALE MARKET

Consideration of the NEM to date reveals that the first of these principles – the establishment of a competitive wholesale market – has clearly been achieved. Five jurisdictions – Victoria, New South Wales, Queensland, the Australian Capital Territory and South Australia – have been participants in the wholesale exchange, pooling and trading generated electricity between them since the NEM's commencement in 1998. By 2006 the NEM had expanded to include Tasmania, whose physical integration into the NEM occurred with the commissioning of the Basslink Interconnector, a subsea electricity cable facilitating submarine electricity transmission between Tasmania and mainland Australia.[8] As a consequence, the NEM provides electricity to almost eight million end users and trades an estimated A$8 billion of energy on an annual basis.[9] It achieves this over a distance of more than 4000 kilometres, making it one of the longest interconnected power systems in the world.[10]

1.1.2. COMPETITIVE RETAIL MARKET

In contrast to the wholesale market, the introduction of competition into the retail electricity sector of the NEM has been neither uniform, nor timely, across the six NEM jurisdictions. For instance, while Victoria first introduced retail competition for large industrial consumers in 1994, the transition to full retail competition was not achieved until 2002.[11] Likewise, NSW's transition to full retail competition occurred progressively between 1996 and 2002.[12] According to the Australian Energy Regulator's most recently available annual report:

> All NEM jurisdictions except Tasmania have introduced full retail contestability (FRC) in electricity, allowing all customers to enter a contract with their retailer of choice. At 1 July 2009, Tasmania extended contestability to customers using at least 150 megawatt hours (MWh) per year. Small business customers that consume more than 50 MWh per year are expected to become contestable on 1 July 2011. All jurisdictions have introduced FRC in gas retail markets.[13]

Another competition-related complexity, arising in respect of the transition of retail functions to the national sphere of responsibility, is the differing nature of price cap regulation across the various NEM jurisdictions. The AER recently commented on this in the following terms:

> In the transition to effective competition, price cap regulation continues to apply in several jurisdictions. At July 2010 all jurisdictions except Victoria

> applied some form of price cap regulation for electricity services ... Australian governments have agreed to review the continued use of retail price caps and to remove them if effective competition can be demonstrated. The AEMC is assessing the effectiveness of retail competition in each jurisdiction, to advise on ways to remove retail price caps. The relevant state or territory government makes the final decision on this matter.[14]

1.2.KEY PHASES OF REFORM

Since its establishment, the governance, legislative, and regulatory regime of the NEM has been subjected to ongoing reform. Three key phases can be identified: (i) Phase 1 (1991–1998); (ii) Phase 2 (1998–2004): and (iii) Phase 3 (2005–present). Key aspects of reforms during these phases of the NEM's development are briefly considered in the following sections. The changing nature of the market objectives is also outlined and summarised in Table 3 and Table 4.

1.2.1. PHASE 1: 1991–1998

In 1991, the *National Grid Management Council* (the NGMC) was established to facilitate a 'co-ordinated electricity market spanning the eastern States, South Australia and the Australian Capital Territory'.[15] In 1992, the *National Grid Protocol* (NGP) was introduced. The NGP articulated the 'rules, responsibilities and technical requirements for connecting to the National Grid and participating in trading in bulk electricity through it'.[16] In 1992, an important intergovernmental body was established, namely the Council of Australian Governments (COAG).[17] Throughout the 1990s, COAG continued to work towards a national electricity market. In 1994 for instance, COAG agreed to the need for accelerated microeconomic reform across the electricity sector.[18] More specifically, COAG agreed that 'structural separation of generation, transmission and distribution, together with uniform network pricing and regulation, were ... necessary to ensure effective implementation of a competitive electricity market'.[19] In addition to improving national and international competitiveness, other benefits said to flow from the widespread electricity market reforms included increasing customer choice, reducing prices, and promoting greater sustainable utilisation of energy resources.[20]

In addition to dealing with the political and physical practicalities of linking the separate markets, it was necessary to harmonise the laws governing electricity markets in individual state and territory jurisdictions.[21] During this phase, COAG endorsed a cooperative legislative scheme – an applied legislation mechanism of harmonisation – that resulted in the legislature in one jurisdiction, South Australia, taking the lead role in respect of energy legislation on a given matter, with the South Australian legislation then mirrored and

applied by the other jurisdictions.[22] This cooperative legislative process gave rise to the foundation statute, the *National Electricity (South Australia) Act 1996*, which was subsequently reproduced in all of the NEM's participating jurisdictions. These legislative developments are set out in Table 2 which is discussed in Part 1.4 below.

In the early 1990s, the initial stages of moving towards a national electricity market saw environmental factors assume an important role in its stated objectives. During this phase, the national market objectives were set out in the NGP, and all of them gave strong focus to the important relationship between energy supply and use and the environment. These objectives are set out in Table 3 below. For instance, in addition to being efficient and economic, electricity industry development was to be environmentally sound. Likewise, the criteria for the maintenance and development of the performance and/or utilisation of the power system were to be technically, economically and environmentally sound.

1.2.2. PHASE 2: 1998–2004

In early 1994, COAG determined that 'regulatory arrangements for the national electricity market' would be 'consistent with reforms of competition policy' and that these would include 'regulation of certain elements of the operation of the market by way of a code of conduct' under the auspices of the ACCC and the then *Trade Practices Act 1974* (Cth).[23] Legislation, drafted to support the establishment of the national market, came into existence in 1996, and entered into force upon the NEM's commencement in 1998.[24] The *National Electricity Law* laid the foundations for the legislative and regulatory framework of the NEM, while the *National Electricity Code* (the Code) set down the code of conduct for the NEM. At this time, the market objectives were contained in the Code and showed a marked shift away from the environmentally sound provisions of the NGP objectives.[25] The National Electricity Code set down a series of market objectives, which where complemented by a further list of Code objectives. These are set out in greater detail in Table 3 and Table 4.

The NGMC and NGP were subsequently replaced by this new cooperative legislative and regulatory framework, which came into effect with the commencement of the NEM in December 1998. The national legal basis of this new national market was founded in three legal instruments: the National Electricity Law,[26] the National Electricity Code (the Code), and the then newly introduced Part IIIA[27] of the *Trade Practices Act 1974* (Cth).[28] Key market institutions introduced at this time included the *National Electricity Code Administrator* (NECA) and the *National Electricity Market Management Company* (NEMMCO). The NECA,[29] was vested with the primary responsibility for administering the Code and was expected to:

(i) promote the effectiveness, efficiency and equity of the national electricity market; and

(ii) lead the development of the market towards more competitive, market-oriented outcomes in order to deliver a viable market that benefits end-use customers.[30]

The second market institution, NEMMCO, was responsible for the day-to-day administration and operation of the National Electricity Market.[31] In addition to ensuring continual improvement of the NEM's efficiency, NEMMCO was required to balance electricity supply and demand through the establishment and operation of a wholesale spot market.[32] NEMMCO's other responsibilities included registering code participants, establishing reporting and consultation procedures,[33] and coordinating, planning for, and maintaining the power system security.[34]

Further policy developments and far-reaching national reforms were introduced into the NEM between 2000 and 2004. This included moves towards the establishment of the *Australian Energy Market* (AEM) and an appropriate national energy policy framework to support the national market. COAG's Communiqué of 8 June 2001 provides the foundations for many of these more recent energy market reforms.[35] In particular, COAG unanimously endorsed the importance of securing a cooperative agreement – between all Australian governments – on energy issues generally, the need for efficient operation of domestic energy markets and the creation of an effective policy framework to direct future energy policy decision making and enhance policy certainty for all energy users.[36] In the same year the Ministerial Council on Energy (MCE) was established. At that time, the MCE's key role was to provide effective policy leadership on national energy matters and to commission an independent market review.[37]

1.2.3. PHASE 3: 2004–PRESENT

COAG's 2004 *Intergovernmental Agreement on Energy* and the ensuing *Australian Energy Market Agreement* (the AEMA) sit at the centre of the most recent series of Australian energy market reforms.[38] Through the AEMA, all of the Australian governments have expressly endorsed many of the recommendations of the 2003 *Parer Report,*[39] especially the recommendation for the development of a truly national and efficient energy market.[40] The AEMA set out the new national governance, regulatory and legislative framework of the Australian Energy Market – and the NEM – and required all Australian governments to enact complementary legislation to ensure a harmonised, cohesive national legislative scheme is created in support the national energy market. As such the AEMA has been said to have significantly enhanced the governance arrangements of the Australian Energy Market, and in turn the NEM, by 'separating policy making, rule-making and energy market development, economic regulation and market rule enforcement'.[41] In short, the AEMC was made 'responsible for rule-making and energy market development at a national level, including in respect of the National Electricity Rules'[42], while the AER has assumed

responsibility 'for economic regulation and compliance at a national level, including in respect of the Australian Energy Market Legislation'.[43] The MCE is still required to make policy in relation to the energy market. In this capacity, the MCE is vested with responsibility for overseeing the new national policy agenda, governance and institutional framework set out in the AEMA.

In mid 2011, COAG decided to merge two existing ministerial councils – the MCE and the Ministerial Council on Minerals and Petroleum Resources (MCMPR) – into one body called the Standing Council on Energy and Resources (SCER). The first meeting of the SCER took place on 9 December 2011.[44] As yet, these changes have not been reflected in the NEL and this nascent body has not yet engaged in any major governance activities in the NEM. Accordingly, the future functions and powers of this new body are not considered further in this report. However, it should be noted that in future the former role of the MCE will now be performed by the SCER.

Further aspects of the market reforms during this phase, including the introduction of a new NEM objective, are discussed further in the following sections.

1.3. NEW LEGISLATIVE AND REGULATORY FRAMEWORK FOR THE NEM

A range of legislative measures have been introduced to provide the requisite federal legislative framework to support the establishment of the Australian Energy Market, and in turn the current NEM and the various bodies vested with responsibility for its development, operation, and regulation.[45] New electricity laws, rules and regulations have replaced the pre-existing electricity legislative scheme – the National Electricity Law, National Electricity Rules and the Code.[46] The current national electricity legal framework is set out in the third column of Table 2 below. Collectively known as the *National Electricity Laws,*[47] the *NEL 2005*, National Electricity Regulations and the National Electricity Rules provide the requisite legal basis for the regulation and operation of the wholesale electricity market and they provide a framework for the economic regulation of electricity transmission and distribution.[48] The *NEL 2005* lays down the legislative framework underpinning their functions, duties and powers. Importantly, through the establishment of these two national bodies, relevant policy and governance matters have effectively been separated from the day-to-day administrative, operational and regulatory matters. The AEMC and the AER have been vested with a range of new legislative powers and functions, whilst the AEMO has assumed the primary responsibility for managing the day-to-day operation of the NEM (power system and the electricity wholesale spot market) and is required to take account of the NEO in this role.[49]

The *NEL* 2005 contains provisions relating to legal proceedings under that Act,[50] to practices and procedures for making National Electricity Rules[51] and to the safety and security of the

national electricity system.[52] The *National Electricity Laws* are supported by the *Competition and Consumer Act 2010*. The Australian Energy Regulator was established in 2004 and is governed by Part IIIA of the *Competition and Consumer Act 2010* (*the CCL 2010*, formerly the TPA 1974), which came into effect as of 1 January 2011.

Two significant developments in the new electricity legislative scheme concerned the new market objective, which focuses on the long term interests of consumers, and the new legal status of the national electricity rules. These are set out in sections 7 and 9 of the *NEL 2005*:

> ***7 National electricity market objective***
>
> The national electricity market objective is to promote efficient investment in, and efficient use of, electricity services for the long term interests of consumers of electricity with respect to:
>
> a. price, quality, safety, reliability, and security of supply of electricity; and
> *b.* the reliability, safety and security of the national electricity system.[53]

> ***9 National Electricity Rules to have force of law***
>
> The National Electricity Rules have the force of law in this jurisdiction.[54]

Table 2: Key legislative developments in the NEM

1992	1998-2005	2005 to 2011	
National Gas Protocol	National Electricity (SA) Act 1996[55]	National Electricity (SA) Act 1996 (as amended)[56]	
	National Electricity Law 1996[57]	National Electricity Law 1996 (as amended) (the *NEL 2005*)[58]	The National Electricity Laws
	National Electricity Code[59]	National Electricity Rules[60]	
	National Electricity (SA) Regulations 1998[61]	National Electricity (SA) Regulations (amended)[62]	
	Trade Practices Act 1974 (Cth) (the TPA)	*Competition & Consumer Law* 2010 (Cth) (formerly the TPA)	
		National Energy Retail Law (South Australia) Act 2011[63]	
		National Energy Retail Law[64]	
		National Energy Retail Rules[65]	
		National Energy Retail Regulations[66]	

The NEO has an important influence on the manner in which the AEMC and the AER perform their functions: both are legally required to take account of the NEO in the exercise of their various powers. The changing nature of the NEO over the three key phases of the NEM's development is summarised in Table 3 and Table 4 below.

Table 3: Changing market objectives 1992 to the present

NATIONAL ELECTRICITY MARKET OBJECTIVE/S			
PHASE	**GENERAL**	**SPECIFIC CRITERIA**	**SOURCE**
PHASE 1 **1992 TO 1998**	Electricity industry development	Efficient Economic Environmentally sound	**National Grid Protocol 1992** (i)
	Power system: maintenance & development of performance &/or utilisation	Technical Economic Environmental	(ii)
	Further environmental considerations	Ecologically sustainable development Specific environmental requirements	(iii)
PHASE 2 **1998 TO 2005**	National Competition Policy	Competitive market	**National Electricity Code 1998** 1.3(1)
	Customer choice	Full retail contestability	1.3 (2)
	Access neutrality	Full network access (transmission & distribution network)	1.3 (3)
	Participant neutrality	New entrants & existing participants treated the same Prohibit anti-competitive behaviour	1.3 (4)
	Energy source & technology neutrality	Energy sources & technologies treated the same Prohibit anti-competitive behaviour	1.3 (5)
	Intra- & inter-state trading neutrality	Uniform inter- & intra-state trading regulations Prohibit anti-competitive behaviour	1.3 (6)
PHASE 3 **2005 TO CURRENT**	Single NEM objective – long term interests of consumers	Efficient investment in electricity services Efficient operation & use of electricity services	**National Electricity Law 2005** s.7
	Electricity supply	Price Quality Safety Reliability Security of supply	s.7
	National Electricity System	Reliability Safety Security	s.7

More recent legislative developments have focused on the transfer of distribution and retail energy regulation functions to the AER and AEMC. The MCE – through two key working bodies[67] – has taken lead responsibility for the development of the legislative and regulatory framework, known as the *National Energy Customer Framework* (NECF). This includes the recently passed *National Energy Retail Law (South Australia) Act* 2011, and the National Energy Retail Regulations and Rules, both of which are yet to be finalised, and are set out in

Table 2.[68] As noted by the AER, the MCE 'agreed on 10 December 2010 that jurisdictions would work towards a common target date of 1 July 2012 for commencement of the new law, rules and regulations'.[69] Given this timeline, further discussion of the NECF is outside the scope and purpose of this Report.

Table 4: Additional objectives: Phase 2 (1998–2005)

NATIONAL ELECTRICITY CODE OBJECTIVES		
GENERAL	**SPECIFIC CRITERIA**	**SOURCE**
Achieve the market objectives	• Light-handed" regulation	**National Electricity Code 1998+** 1.4(b)(1)
Set of market-oriented rules	• Market operations • Power system security • Network connection • Access & network services pricing	1.4(b)(2)
Dispute resolution	• Provide cost-effective framework	1.4(b)(3)
NE Code breaches	• Provide for adequate sanctions	1.4(b)(4)
NE Code changes	• Provide efficient processes	1.4(b)(5)
Technical & market operations	• Responsibilities of all Code participants • Detailed market rules, including bidding, dispatch, spot price determination & settlements arrangement • Detailed operational requirements (incl. Power system operations & security, emergency operations, metering & maintenance scheduling) • Terms and conditions of access & technical standards for connection to the network • Pricing network services methods.	1.4(b)(6) (i)-(v)

2. WHO IS RESPONSIBLE FOR THE NEM?

2.1. CHANGING MARKET INSTITUTIONS, PARTICIPANTS AND RESPONSIBILITIES

The changes to the nature and number of institutions and market participants in Phase 3 of the NEM's development have been significant. In addition to the introduction of new key bodies, several market participants have seen their roles change, while other bodies have been abolished altogether. By way of an overview, the new governance arrangements, together with the new division of functions and powers between existing and new energy market institutions, have been summarised in Table 5. Key governance and regulatory changes of the past half-decade concern the roles of the MCE, the AMEC, the AER and the AEMO.

Table 5: Key National Energy Market institutions and Key Responsibilities

KEY BODY	DATE START	KEY RESPONSIBILITY
ACCC	1995	Competition regulation, industry code access and authorisations.
ACT	2004	Merits review.
AEMC	2004	Rule-making and energy market development
AEMO	2009	Market manager – the day-to-day operation of the NEM (power system and the electricity wholesale spot market).
AER	2005	Economic regulation and market rule enforcement, distribution and retail (2010 onwards).
COAG	1992	Intergovernmental agreement on energy policy and future market development.
ERIG	2006	Established by COAG to investigate and make recommendations on future NEM reforms in respect of the efficiency of market structures, the transmission network and energy financial markets' performance. Dissolved in 2007 following completion of report.
FCA	1995	Judicial review.
MCE	2001	Policy making (SCO, Retail Policy Working Group & Joint Implementation Group).
NECA	1998	Code Administrator – dissolved 2004.
NEMMCO	1998	Market Manager – dissolved 2009.
NET	1998	Merits Review – dissolved 2004.
RELIABLITY PANEL	2005	Monitor, review, report and provide advice on the safety, security and reliability of the national electricity system (under auspices of AEMC).

The *NEL 2005* lays down the legislative framework underpinning the functions, duties and powers of the key NEM institutions. Importantly, through the establishment of these national bodies, relevant policy and governance matters have effectively been separated from the day-to-day administrative, operational and regulatory matters. The functions and powers of these market institutions is discussed in great detail elsewhere, in particular on the websites of each institution, and need not be reproduced in detail here. However, it is useful to draw attention to several noteworthy features of their respective roles in the NEM and highlight key changes to the NEM's governance and regulatory framework.

2.1.1. THE AEMC AND THE MCE

The AEMC is vested with the primary responsibility for rule making in the new national market. Relevantly, s 34 of the *NEL 2005* sets down the subject matter and nature of the National Electricity Rules which the AEMC may make in the course of performing its specific functions and powers. The AEMC can make rules with respect to the operation of the NEM and the activities of market participants.[70] Further to specific rule making and market development functions, the AEMC has also been vested with a broad power to 'do all things necessary or convenient to be done for or in connection with the performance of its functions'.[71] More importantly, in exercising its functions and powers, the AEMC is required to have regard to the national electricity market objective noted previously,[72] and to take all necessary steps to ensure confidential information provided to it is protected from unauthorised use or disclosure.[73]

To date, the AEMC and the MCE have effectively shared the governance sphere of the NEM. As mentioned previously, COAG has recently established a new body (SCER) which will, broadly fulfil the former role of the MCE. The full scope of the functions and powers of this new body as are yet not expressed in legislative form are therefore outside the discussion in this Report.

Under the current legislative scheme, the MCE (presumably in future, SCER) is required to liaise with the AEMC on matters of market development, can initiate a proposal for a NEM rule change and publish statements of relevant energy policy principles.[74] It is also required to take the NEO into consideration.[75] Two working groups have been formed within the MCE Standing Council of Officials – the Retail Policy Working Group and the Joint Implementation Group – both of which have been assisting with the development of legislative and regulatory arrangements regarding the transfer of energy distribution (non-economic) and retail regulation functions to the national energy market in the MCE 2007 legislative package. Making sure that the necessary structure of consumer protections is fully accounted for in the new regulatory regime – known as the *National Consumer Protection Framework* – has been a central feature of this process. A range of critical consumer issues has been consulted on, including retailer obligations for supply to small

customers, customer market contracts and marketing.[76] Consequently, this has been an extremely important process for consumers in all NEM jurisdictions.

2.1.2. THE AER AND THE AEMO

The AER operates under the broad mantle of the ACCC and is the principal energy regulator of the Australian Energy Market.[77] Most of the existing regulatory powers and duties of the ACCC in relation to the electricity market have been transferred to the AER. Thus, as the pre-eminent regulator in the energy industry, the AER has a pivotal role in the operation of the market and regulation of the conduct of market stakeholders across the NEM. In this capacity, the AER has had primary responsibility for economic regulation of the NEM's wholesale market and the transmission and distribution networks. The AER's role is expanding at present to encompass non-economic regulation of the NEM's retail markets. The functions and powers of the AER are contained in Part 3 of the *NEL 2005*, together with requirements on the manner in which such functions and powers are to be exercised. Section 15 of the NEL 2005 sets out the general functions and powers of the AER, while Section 16 focuses specifically on the manner in which the AER must perform or exercise its economic and regulatory functions or powers. The latter section states that, in addition to having regard to the national electricity objective[78] when making a determination (e.g. transmission), the AER is also required to ensure that relevant market participants are properly informed about matters under consideration and that they have an opportunity to make submissions accordingly. Also, the AER must ensure that affected parties have a reasonable opportunity to recover costs of compliance with regulatory obligations, as well as provide effective incentives to promote economic efficiency in the provision of electricity services. Like the AEMC, the AER is also required to observe legal requirements regarding the confidentiality of information provided to it in the course of its operations.

The AEMO has assumed the role of market manager and as such, is primarily responsible for managing the day-to-day operation of the NEM (power system and the electricity wholesale spot market). Under s 49 of the NEL, the AEMO's functions include operating, administering and improving the effectiveness of the wholesale exchange, registering participants and maintaining and improving the power system security. The AEMO is also required to take account of the NEO in its energy market role.[79]

While each of the key market institutions are clearly empowered to take account of the NEO in their various actions, there is no single body vested with the sole responsibility of ensuring that the NEM does in fact meet the NEO. That is not to say that the current institutions fail to meet their statutory obligations. On the contrary, a cursory examination of the AMEC's rule change procedures, for instance, makes it clear that the AEMC requires proponents to take the NEO into consideration in relation to any proposed rule change.

However, over and above the general *responsibility* imposed on each body to take the NEO into account and to act consistently with the NEO, it is not clear who is *accountable* in practice for the NEO being met and how such accountability applies. For example, while there are very large amounts of data collected and reported against a wide range of criteria, there is not currently any specific accountability mechanism in place to evaluate the extent to which the NEM is meeting the market objective. Greater transparency in respect of such matters, including the basis upon which the key market institutions determine that their actions and/or decisions satisfy the NEO, would provide greater certainty and improved understanding of the roles of the key market institutions in ensuring the NEM operates efficiently in the long term interests of consumers.

3. THE LONG TERM INTERESTS OF CONSUMERS AND THE NEO

Part 3 of this Report considers what are the long term interests of consumers and how do they relate to the current and past electricity market objectives? The history of these developments from the early 1990s to the present day explored above are drawn upon, with the intention of highlighting both the present and historical importance of the integration of several core principles into the framework of the NEM and the effectiveness, or otherwise, of the NEO in the context of meeting the long term interests of consumers. By way of comparative analysis, brief overviews of energy market experiences outside Australia are also included in this part.

3.1. LONG TERM INTERESTS OF CONSUMERS: SURVEY ANALYSIS

As noted above, the NEO as stated in the National Electricity Law identifies five key criteria for considering "the long term interests of consumers":

i. Price;
ii. Quality;
iii. Safety;
iv. Reliability; and
v. Security of supply.

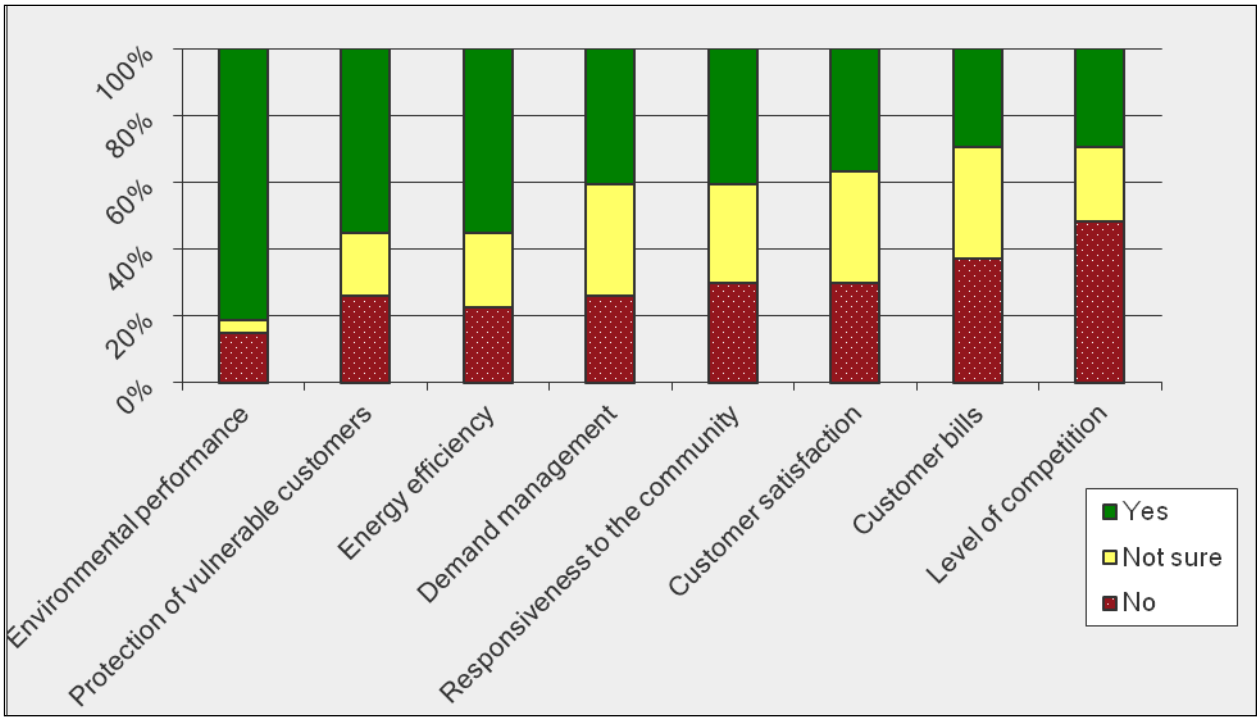
A key focus of this report is, what does "the long term interests of consumers" actually means. Are these long term interests adequately reflected in the five criteria currently included in the NEO? To this end, a survey of consumer advocate organisations and other market stakeholder organisations was conducted (see Appendix A for a detailed methodology, Appendix B for the list of organisations invited to participate in the survey and Appendix C for the survey itself). Participants were asked questions directly related to the NEO and the long term interests of consumers, specifically:

- What are the most important criteria and associated indicators for the long term interest of electricity consumers?
- What criteria for the long term interest of electricity consumers do you think should be included in the National Electricity Objective?

As part of the survey, 13 criteria for the long term interests of electricity consumers, including the five already stated in the NEO, were provided as options.

While respondents nearly unanimously agreed that the existing criteria of price, quality, safety, reliability and security of supply should be included in the NEO, there was less agreement on potential additional criteria as shown in Figure 5 below.

Figure 5: Which other criteria should be in the National Electricity Objective?



(Survey Question: "Of the other possible criteria, which should be included in the National Electricity Objective?")

The potential criterion that respondents most strongly agreed should be included was 'environmental performance', with 81% agreeing that it should be included while 15% disagreed. 'Protection of vulnerable consumers' and 'energy efficiency' both had more than twice as many respondents call for inclusion than not. 'Demand management' also attracted a strong degree of agreement from respondents that it should be included (41%) versus 26% who disagreed. On balance, respondents disagreed that 'level of competition' should be included as a criterion and, to a lesser extent, also rejected including 'customer bills'.

Respondents were also asked to rate a series of Key Performance Indicators (KPIs) based on whether they thought it was important to include them as a measure of the performance of the NEM. The results of these KPI ratings contrast slightly with the results outlined in 6.

Figure 6: Top 15 KPIs - Ranking based on average of *all survey participants*

Criteria Colour Key

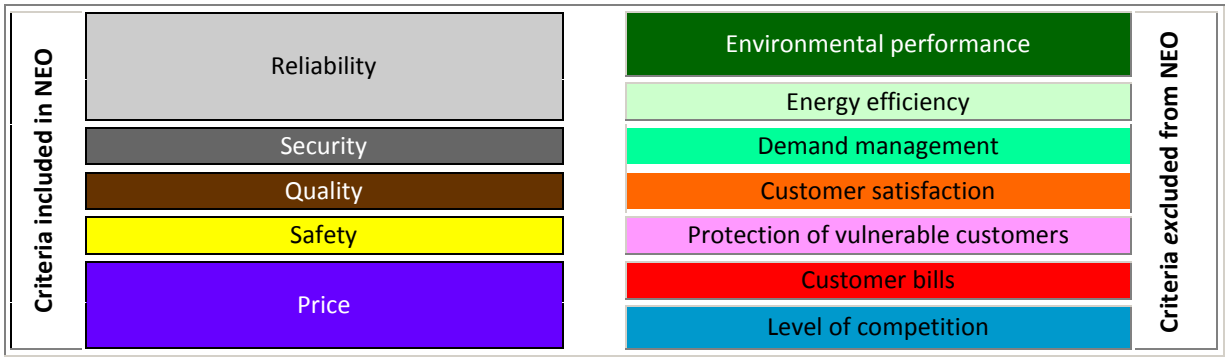


Figure 6 shows the 15 highest-ranked KPIs from the survey, colour coded by long term interest of consumers criteria. Included in the top 15 KPIs are: extent of market concentration (ranked 3rd), a measurement or KPI relating to the 'level of competition' criterion; and 'average annual residential customer's electricity bill as a proportion of household expenditure' (ranked 6th), which is a measurement of the 'customer bills' criterion. This suggests that survey respondents do consider the criteria 'level of competition' and 'customer bills' important as items of long term consumer interest.

Survey respondents also supported having a NEO which included several specific criteria in preference to a general NEO without specific criteria by 67% to 11%. Respondents also supported a change to the wording of the NEO from 'the long term interests of consumers of electricity' to 'the long term interests of the community', but not by a wide margin.

3.2.OTHER LONG TERM INTERESTS OF CONSUMERS

Social and environmental considerations, as they relate to the national electricity market objectives, have at times been included, and at other times excluded, from the official policy and the legislative framework of the NEM. As noted above, social equity and environmental considerations were identified as important issues in the energy market context by consumer groups and other market stakeholders. When these responses are considered within the broader policy debate and development of the NEM during the past two decades, it is clear that in addition to the criteria currently included in the NEO other long term interests of electricity consumers, such as environmental and social considerations, are of considerable interest and importance.

3.2.1. ENVIRONMENT AND SOCIAL RESPONSIBILITY POLICY DEBATE

Between 1998 and 2004, the need to take account of energy market environmental externalities drew comment from important key stakeholders, in particular COAG and the MCE. COAG observed that 'careful policy design' was necessary to ensure that 'fuel choice and use are optimised from economic, operational, reliability and security of supply, and environmental perspectives.'[80] COAG clearly set out the importance of ensuring that domestic energy markets were socially responsible and environmentally sustainable:

> COAG also recognised that energy markets should operate to maximise provision of reliable energy services and that the effective operation of an open and competitive energy market contributes to delivering benefits to households, small business and industry. ... The challenge for the energy sector is to deliver these benefits within a sustainable development framework and to meet expectations of social responsibility and responsiveness to consumers.[81]

It was further agreed that an important national energy policy objective was to moderate greenhouse gas emissions, with COAG stating that the NEO should include the objective of minimising both the local and global environmental impacts of energy production, transformation, supply and use, in particular greenhouse gas emissions.[82] At that time the newly established MCE was vested with a responsibility to take account of the environmental impact of the energy sector and was required to provide national 'leadership so that consideration of broader convergence issues and environmental impacts are effectively integrated into energy sector decision-making'.[83] In the following year, COAG's independent market review, *Towards a Truly National and Efficient Energy Market* (the *Parer Report*), identified a number of serious environmental deficiencies in the NEM.[84] The report found that the various responses to the problem of greenhouse gas emissions were ad hoc, uncoordinated, poorly targeted and often competed with rather than complemented each other.[85] Furthermore, the *Parer Report* advised that even with the vast array of federal and state measures already in place, Australia's greenhouse gas emissions had continued to rise.[86] The MCE's responding report to COAG also emphasised the problem of climate change and the need to address greenhouse emissions from the energy sector.[87] Likewise, the Federal Government's 2004 Energy White Paper, *Securing Australia's Energy Future*, and the 2006 update, drew attention to the importance of addressing climate change by lowering Australia's greenhouse gas emissions and meeting environmental, as well as economic goals, in energy production and use.[88] More recently, the *Garnaut Review* clearly identified the inextricable nature of the relationship between energy and the environment. Specifically, the *Garnaut Report* observed that the economy and the environment are closely connected that the latter cannot be externalised from the debate and development of the national energy market.[89]

3.2.2. THE CHANGING NATURE OF THE NEO

Despite many views supporting the need to internalise environmental and social considerations, the current legislative and regulatory framework of the NEM, and plans for its future development, fail to do so. This is illustrated by the changing market objectives – set out previously in Table 3 which shows the shift of the NEO away from its initial environmentally and socially focused objectives, through its adoption of competition principles and the current focus on efficiency. This legislative turn of events, and the implications flowing from the absence of environmental and broader social considerations, is at odds with the previous decade of policy debate and other national and state-based legislative developments (as discussed in Part 1 and Section 3.2.1). Moreover, broader social responsibilities do not feature in the NEO as part of consumers' long terms interests.

An explanation for the existence of these perceived deficiencies in the NEO is to consider the second reading speech of South Australian Minister for Energy Pat Conlon.[90] The speech was given during the introduction of the national electricity legislation into parliament, and the following extract provides some insight into the legislature's intention regarding the NEO:

> The market objective is an economic concept and should be interpreted as such. For example, investment in and use of electricity services will be efficient when services are supplied in the long run at least cost, resources including infrastructure are used to deliver the greatest possible benefit and there is innovation and investment in response to changes in consumer needs and productive opportunities. The long term interest of consumers of electricity requires the economic welfare of consumers, over the long term, to be maximised. If the National Electricity Market is efficient in an economic sense the long term economic interests of consumers in respect of price, quality, reliability, safety and security of electricity services will be maximised.[91]

This approach was endorsed by the Expert Panel of Energy Network Pricing, in its 2006 Report to the MCE. In addition to remarking on 'an evident trend away from lists of independent objectives and towards the inclusion of a single, overarching objective with an efficiency focus'[92], the Expert Panel expressed the narrow view that 'the elements of productive, allocative and dynamic efficiency, neatly encapsulated in the first paragraph of the extract, are at the core of the objective.[93] The legislature's intention to interpret the NEO narrowly is further evidenced by subsequent comments of Minister Conlon in his second reading speech, made at the time of subsequent amendments in 2007:

> It is important to note that the National Electricity Objective does not extend to broader social and environmental objectives. The purpose of the National Electricity Law is to establish a framework to ensure the efficient operation of the National Electricity Market, efficient investment, and the effective regulation of electricity networks. As previously noted, the National Electricity Objective also guides the Australian Energy Market Commission and the Australian Energy Regulator in performing their functions. This should be guided by an objective of efficiency that is in the long term interest of consumers. Environmental and social objectives are better dealt with in other legislative instruments and policies which sit outside the National Electricity Law. [94]

These speeches raise several points of discussion. First, it is important to note that these comments were made at a time when national responsibility for the NEM was restricted to the regulation of transmission and distribution of energy services. Nevertheless, it is clear that according to these second reading speeches, the NEO was intended to be read narrowly, clearly confining the long term interests of consumers to *economic* interests, in particular price, quality, safety, reliability and security. There is, however, no reason why this has to be the case. On the contrary, with the transfer of retail functions to the national market institutions, it is perhaps preferable that consumers' economic interests be read

more broadly. As Brody suggests, if 'economic' is understood as 'relating to the production, distribution and use of income and wealth' then this would permit consideration of how 'wealth or value is distributed among the population'.[95] Such broader views of economic interests have a close correlation with the wider consumer-based retail functions currently being vested in the NEM and the functions of the key market institutions.

These observations link into the second point of discussion arising out of Minister Conlon's speeches, namely the unrelenting focus on economic interests and the resulting shift in the underlying nature of the market objective, as it is understood by key market stakeholders. As Cantley-Smith has observed, the national energy market legislative and regulatory regime has undergone significant changes in recent years, all of which call for a reconsideration of the interpretation of the NEO and the unrelenting focus on competition and efficiency.[96] Cantley-Smith points out that:

> The second reading speeches of Minister Conlon reveal an interesting transformation in the asserted nature of the NEO. In the first of these speeches, the Minister makes it clear that improved efficiency is the key means for ensuring the market objective – the long term interests of consumers – is satisfied. However, by 2007, this has changed, albeit slightly but importantly to one where efficiency has become the primary objective to, rather than the means of, ensuring the long term interest of consumers. This small change in focus is consistent with the goals of economic efficiency and competition that have dominated market development throughout the past six years.[97]

The shift in the focus of the NEO increases the importance of ensuring that the means and methods of market development do not, incorrectly, assume the role of actual market objectives. This potential problem was clearly spelt out in the *1993 Hilmer Report*:

> Competition policy is not about the pursuit of competition per se. Rather it seeks to facilitate effective competition to promote efficiency and economic growth while accommodating situations where competition does not achieve efficiency or conflicts with other social objectives. These accommodations are reflected in the content and breadth of application of pro-competitive policies, as well as the sanctioning of anti-competitive arrangements on public benefit grounds.

Thirdly, Minister Conlon suggested that 'environmental and social objectives are better dealt with in other legislative instruments and policies which sit outside the National Electricity Law'. [98] Developments of this kind are clearly evident at both national and state levels, and further explain the absence of social and environmental considerations in the NEO. Long term consumer social and environmental interests currently exist in separate

and distinct legislative and regulatory schemes, which effectively place such objectives outside the immediate realm of the NEM's legislative and regulatory framework and therefore, outside the ambit of responsibility of key market institutions. For instance, to date, matters of social responsibility – for example, hardships facing vulnerable and low income users – have been dealt with at a state level, with varying degrees of effectiveness. In Victoria for instance, a great deal of effort has gone into providing the necessary safety nets for vulnerable and low income electricity consumers.[99] To date this has resulted from the retention of state responsibility for the retail end of the electricity market. However, with the move towards a full national energy market, and the transfer of retail functions to the key national bodies, the various state-based legislative and accountability measures have not been transferred into the primary national legislative framework. On the contrary, an entirely separate legislative scheme has been created: the *National Energy Consumers Framework*.[100] Likewise, at the national level environmental matters affecting energy markets exist in entirely separate legislative frameworks, e.g. the *National Framework for Energy Efficiency* and the *Energy Efficiency Opportunities Act* 2006 (Cth) and regulations[101]; the MRET and more recently the RET[102]; and the *National Greenhouse and Energy Reporting Act 2007* (Cth) (NGER).[103]

While these developments are, from one perspective, highly commendable, from another they represent a fundamental shift in energy market governance, regulation and operation. Notably, these legislative schemes have seen the removal of social and environmental considerations from the immediate NEM governance, legislative and regulatory frameworks. As such, important energy market externalities are in fact removed from the ambit of responsibility of key decision makers and major stakeholders. This disconnect of environmental considerations, particularly from the day-to-day operations of the energy market, is a significant barrier to ensuring Australia moves to a low carbon future.

The failings of the current NEO, and ultimately the NEM, have received widespread comment, which makes it clear that there is an increasing recognition that environmental and social considerations have been for too long ignored or excluded from the economic debates surrounding the development and operation of the NEM.[104] The over-reliance on an "economic rationalist" approach to developing and operating the NEM is something that demands greater attention and reconsideration. As TEC has pointed out, the 'economic rationalist framework does not free policy designers and decision makers from the responsibility of taking the broader context of policy into account'.[105] Thus, while the focus on competition and efficiency may have been acceptable when the national regulatory framework was limited to economic functions, the same cannot be said for the current situation. As the national market has expanded to incorporate retail and non-economic distribution functions, the need to expand the definition of the NEO to reflect these significant changes warrants serious attention and consideration by all stakeholders.

3.2.3. INTERNATIONAL ENVIRONMENTAL AND SOCIAL OBJECTIVES

In contrast to Australia, several overseas electricity markets currently have embedded social and environmental objectives. Examples of this include the UK, where the principle regulator, the Office of Gas and Electricity Markets (OFGEM) is required to observe the following electricity market objective:

> The Authority's principal objective is to protect the interests of existing and future consumers in relation to gas conveyed through pipes and electricity conveyed by distribution or transmission systems. The interests of such consumers are their interests taken as a whole, including their interests in the reduction of greenhouse gases and in the security of the supply of gas and electricity to them.[106]

Some of these same principles are echoed in US documents written by the Federal Energy Regulatory Commission whose mission is 'reliable, efficient and sustainable energy for customers'.[107]

These themes appear again in Canada where the Canadian National Energy Board, the body tasked with regulating energy development in the Canadian public interest has defined public interest as:

> Inclusive of all Canadians and refers to a balance of economic, environmental and social considerations that changes as society's values and preferences evolve over time.[108]

Numerous reports and responses within Australia have also called on the NEM to broaden its objectives to include social and environmental considerations. Examples of this include the following by Lord Mayor of Sydney, Clover Moore:

> The City believes that is the AER's role to create an energy sector that can effectively minimise financial and environmental costs to consumers.[109]

Other reports have found that NEM market reform to date had not resulted in positive climate change outcomes and has mixed equity outcomes.[110] Some organisations have gone so far as to issue outright declarations that the NEM does not address the environmental and social concerns held by the Australian community.[111]

Based on this research, it is clear that a wide range of organisations and government bodies support the inclusion of environmental and social objectives in the management of the NEM as well as in international electricity markets.

4. NEM REPORT CARD

The National Electricity Market Report Card rates the NEM's performance with respect to 12 criteria for the long term interests of consumers. This section of the report identifies the criteria and KPIs included in the Report Card, outlines the Report Card itself, details the scoring process for each KPI, and compares the results of the Report Card to results from the stakeholder survey.

4.1. CRITERIA AND KEY PERFORMANCE INDICATORS

When choosing the criteria and KPIs for the Report Card it was important to recognise that poorly chosen indicators can drive poor and perverse outcomes. Indeed in simplifying concepts into a number or grade, many of the subtleties and interconnectors of real situations are missed. As such, indicators should not be the sole drivers of action, particularly within a system as complex as the NEM. Nevertheless, while performance indicators alone do not guarantee effective outcomes, performance is likely to be much enhanced if the outcomes are measured and reviewed against well-designed indicators.

To this end, a set of criteria and indicators was developed to provide a transparent, comprehensive and accessible snapshot of how the NEM is currently performing. In so doing, we hope to motivate and encourage a greater and more diverse stakeholder discussion and input into the development of new and better indicators for the NEM and specifically the long term interests of consumers of electricity in Australia. It should be noted that the KPIs chosen are interrelated and as such while one KPI might perform well, it may be at the expense of another (see Section 4.5.3 for a short discussion of such tensions).

The criteria chosen for the Report Card include the five criteria from the current National Electricity Objective and seven potential additional criteria identified by consumer advocates and other key stakeholders as important. A detailed account of how and why these criteria and KPIs form the basis of this Report Card is given in Appendix A. The grades given in the Report Card are explained in Table 6.

Table 6: Report Card Grading Scales Explained

Grade	Performance Level
A	Very Good
B	Good
C	Fair
D	Poor
F	Very Poor
Ungraded	Unable to provide a grade due to inadequate data

4.2.REPORT CARD

The National Electricity Market Report Card – 2011

	CRITERIA	GRADE*	KEY PERFORMANCE INDICATOR
Criteria included in the NEO	Reliability	B	System Average Interruption Duration Index (SAIDI)
			Reliability Unserved Energy
	Security	C	Estimated Security Unserved Energy
	Quality	Ungraded	Customer Severity Index (CSI)
	Safety	Ungraded	Lost time injury frequency
	Price	C	Retail price of electricity for residential customers (c/kWh)
			Retail price of electricity for small business customers (c/kWh)
Criteria excluded from the NEO	Customer bills	B	Average annual residential customers electricity bill as a proportion of household expenditure
	Environmental performance	F	Annual greenhouse gas emissions from the electricity sector (tonnes CO_2e/year)
			Greenhouse gas intensity of electricity supply (kg CO_2e/MWh)
			Renewable energy as a proportion of total electricity generation (% of total MWh)
	Energy efficiency	D	Electricity savings from energy efficiency programs as % of total electricity consumed (% of total MWh)
	Demand management	D	Proportion of peak demand met through demand management programs (% of total MW peak)
	Protection of vulnerable customers	C	Number of disconnections of residential customers on payment plans and pensions
			Number of households that are 'energy poor' (electricity costs > 10% of household budget)
	Customer satisfaction	C	Number of complaints per year
			Surveyed customer satisfaction
	Level of competition	B	Extent of generation market concentration
			Extent of retail market concentration

*Note: where there is more than one KPI per criterion, the criterion grade is a composite of the KPI grades.

4.3.SCORING OF KEY PERFORMANCE INDICATORS

The scoring of each KPI is based on best available NEM data, benchmarked against best available international, Australian or NEM data where possible and appropriate. A detailed overview of the scoring methodology is provided in Appendix A Part 5 and Part 6.

4.3.1. RELIABILITY - GRADE B

4.3.1.1. SYSTEM AVERAGE INTERRUPTION DURATION INDEX - *GRADE B*

KPI: System Average Interruption Duration Index (SAIDI)

AEMO defines reliability in the NEM as a measure of the power system's capacity to continue to supply sufficient power to satisfy customer demand, allowing for the loss of generation capacity.[112] Reliability events are caused by a lack of capacity due to power system equipment reaching operational limits and generally occur when reserve capacity in the system has been exhausted.[113] Further discussion of reliability in the NEM and how it is differentiated from security is provided in Section 4.5.2.

One of the most frequently used indicators of distribution network reliability in Australia is the System Average Interruption Duration Index (SAIDI). SAIDI is the sum (in minutes) of the duration of each sustained customer interruption, divided by the total number of distribution customers, excluding momentary interruptions of one minute or less duration.[114] It reflects total outages experienced by distribution customers, including outages arising from the generation and transmission sectors. This is important, as from a customer's perspective it is not possible to distinguish between supply interruptions caused by distribution, generation or transmission outages. SAIDI data is most often normalised to remove "exceptional" events such as the impact of natural disasters.[115]

All NEM jurisdictions report SAIDI, however care must be taken when comparing cross-jurisdictional data, as variations exist in the types of network disruptions included, and in the network's geographical conditions and design.[116] Noting these caveats, SAIDI data indicates electricity networks in the NEM have delivered reasonably stable reliability outcomes over the past five years. Across the NEM, a typical customer experiences around 200 – 250 minutes of outage per year, but significant regional variations often occur owing to variables such as the size and regional spread of network and local extreme weather events.[117]

The capital-intensive nature of distribution networks means it is expensive to build the higher levels of redundancy required to obtain higher levels of reliability[118]. In addition, distribution outages are often more localised than generation or transmission outages and

as such the standards for distribution networks are less stringent than those for generation or transmission. Distribution outages are responsible for approximately 90 per cent of the duration of all electricity outages in the NEM. The AER defends this outcome stating a reliable network keeps electricity outages to efficient levels rather than trying to eliminate every possible interruption.[119]

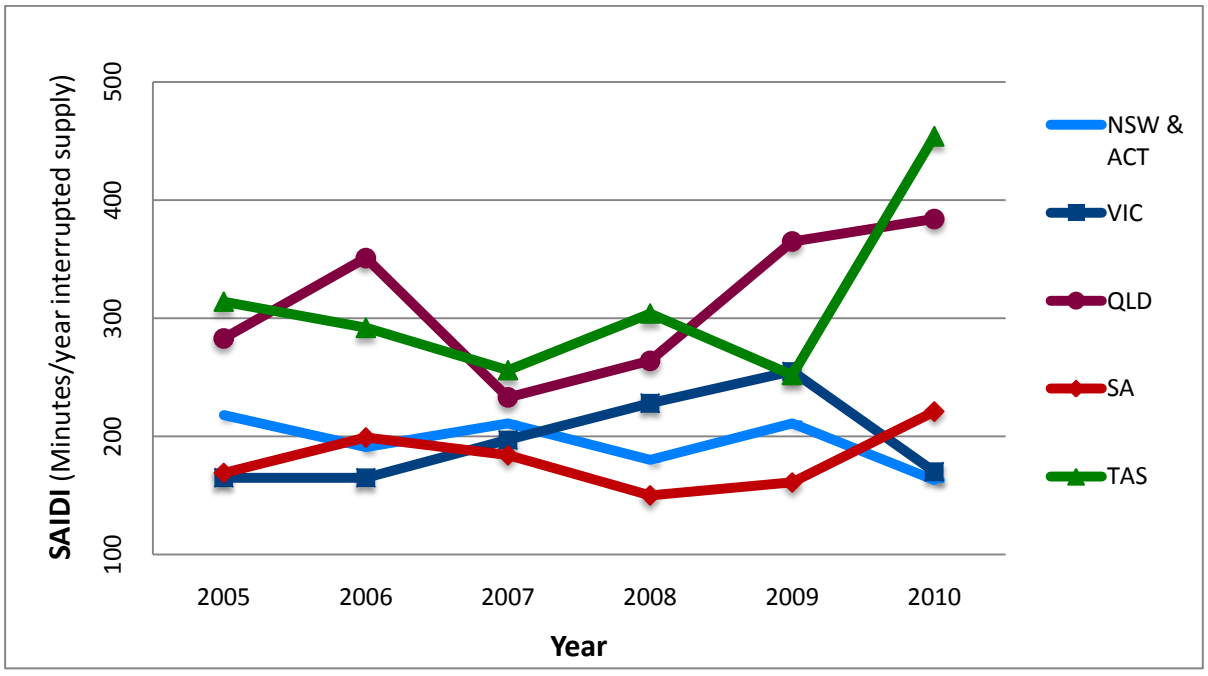
Historical national benchmarking

Historical SAIDI data for NEM regions are shown in Table 7 below and graphed in Figure 7.

Table 7: Historical Reliability (SAIDI values) for NEM regions[120] [121]

System Average Interruption Duration Index (SAIDI) (minutes)						
Year	**NSW & ACT**	**VIC**	**QLD**	**SA**	**TAS**	**NEM Weighted Average**
2005	218	165	283	169	314	211
2006	191	165	351	199	292	221
2007	211	197	233	184	256	211
2008	180	228	264	150	304	213
2009	211	255	365	161	252	254
2010	163	170	384	221	454	227

Figure 7: Five-year trend in NEM Reliability (SAIDI)[122]



The trend in NEM reliability is depicted in Figure 7 as. NEM SAIDI performance over this period has been reasonably stable. This data is derived from the AER for the period 2005 to 2009. (However, ESAA data was used for 2010, as at the time of writing the AER had not yet released data covering 2010. The upward trend for Queensland and Tasmania between 2009 and 2010 is likely to be largely due to SAIDI reporting method differences between

the 2005-2009 AER data and the ESAA in 2010). A proposed grading scale for weighted NEM SAIDI performance based on its own historical performance is provided in Table 8. This historical grading scale was developed by taking the minimum and maximum state values for SAIDI between 2005 and 2010 and assigning A and F to these values respectively. The intermediate values are spread equally between these maximum and minimum values.

Table 8: NEM SAIDI Historical Grading Scale

Grade	SAIDI (minutes)
A	<150
B	150 – 250
C	250 – 350
D	350 – 450
F	>450

Based on the national historical grading scale shown in Table 8 the NEM scores a **B** for SAIDI in 2010.

International benchmarking

For the purposes of international benchmarking a breakdown of unsupplied minutes across generation, transmission and distribution over a selection of European countries is shown below in Table 9.

Table 9: Unsupplied minutes per year for selected European Countries[123]

Unsupplied Minutes Per Year For Selected European Countries									
Year	**Austria (HV, MV)**	**Denmark (HV, MV)**	**Germany (HV, MV, LV)**	**Iceland (HV, MV, LV)**	**Italy (HV, MV, LV)**	**Lithuania (HV, MV, LV)**	**Portugal (HV, MV, LV)**	**Spain (HV, MV, LV)**	**UK (HV, MV, LV)**
2005	31.35	-	-	127.18	65.74	92.39	142.82	117	61.04
2006	48.07	22.20	21.53	106.17	53.84	89.28	152.08	112.8	89.43
2007	45.50	21.70	-	77.93	52.47	92.21	102.54	103.8	-

Note: HV = High Voltage, MV = Medium Voltage, LV = Low Voltage

Both the Council of European Energy Regulators (CEER) and KEMA Consulting stress that calculation of SAIDI varies between countries and care must be taken when comparing SAIDI figures to ensure the method of calculation is sufficiently similar to allow a valid comparison.[124] For example, every country has its own methodology for determining what constitutes an exceptional event (events excluded from calculation).[125] Thus CEER in its 4th benchmarking report on the quality of electricity supply presents SAIDI as "minutes lost per year" to allow comparison.

An additional consideration when comparing "minutes lost per year" between the NEM and European countries is the area covered by the network and the degree of

interconnection or mesh within the network. The NEM covers a far larger area than networks in countries like Italy, Denmark and Austria. Of the countries shown, Spain is the closest in size to Australia being approximately 1/15th the land area, however the extent of interconnection in the Spanish electricity network is far greater than the NEM. Table 10 ranks NEM SAIDI performance against selected CEER member countries using 2007 data and Table 11 shows a proposed grading scale for comparison of the NEM with CEER countries.

Table 10: NEM International Reliability Ranking for 2007[126]

NEM SAIDI International Ranking for 2007	
Country	**Unsupplied Minutes**
Denmark (HV, MV)	21.7
Austria (HV, MV)	45.5
Italy (HV, MV, LV)	52.5
Iceland (HV, MV, LV)	77.9
Lithuania (HV, MV, LV)	92.2
Portugal (HV, MV, LV)	102.5
Spain (HV, MV, LV)	103.8
Australian NEM	211

Note: HV = High Voltage, MV = Medium Voltage, LV = Low Voltage

Table 11: NEM SAIDI International Grading Scale

Grade	Explanation
A	Within top 20% of best performing CEER member Countries with respect unsupplied minutes
B	Within top 20-40% of best performing CEER member Countries with respect unsupplied minutes
C	Within top 40-60% of best performing CEER member Countries with respect unsupplied minutes
D	Within top 60-80% of best performing CEER member Countries with respect unsupplied minutes
F	Bottom 20% of OECD of best performing CEER member Countries with respect unsupplied minutes

When comparing unsupplied minutes between the NEM and the electricity systems in seven European countries, the NEM is ranked last, with the most unsupplied minutes for 2007. Based on this result, the NEM scores an **F** for SAIDI in 2007 based on international ranking. However, owing to the geographical differences and the differences in calculation of SAIDI between the NEM and CEER countries, preference is given to the NEM national historical grading scale.

In the light of the above analysis, the NEM scores a **B** for overall Reliability in 2010.

4.3.1.2. RELIABILITY STANDARD – UNGRADED

KPI: Reliability Unserved Energy

An additional prominent measure used to benchmark reliability in the NEM is Unserved Energy (USE) which is a measure of the energy that was not delivered as a result of reliability (capacity) related events. Reliability USE is historically assessed against a reliability **standard** and is therefore not conducive to assessment with the grading scale used in this report. Instead it is has been included to illustrate how reliability is calculated in the NEM and has been assessed using a pass or fail grade only. The grade assigned to reliability USE has not been included in the assessment of the final grade assigned for reliability in the NEM.

Reported by financial year, USE is the maximum expected amount of energy at risk of not being delivered to customers due to a lack of available capacity.[127] The AEMC Reliability Panel is responsible for setting the reliability standard and stipulates that no more than 0.002% of customer demand in each NEM region should be unserved (USE) by generation capacity in the region, allowing for demand-side capacity and import capacity from interconnectors.[128] Supply interruptions in transmission and distribution networks that do not impact on inter-regional transfer capability are not included in USE.[129] These interruptions are subject to different standards and regulatory arrangements.[130] As such, the Reliability Standard applies to supply interruptions classified as reliability events[131] that originate in the generation sector and the inter-regional elements of the transmission sector.[132] Further, reliability USE considers only USE due to the lack of generation or inter-regional transmission capacity during normal operation of the network within its designed security level, i.e. during a single contingency (credible) event, but not during a multiple contingency (non-credible) events. Any USE experienced due to a multiple contingency event or due to the management of multiple contingency events is classed as a security[133] event.[134] From 2005 on, reliability events in the generation and inter-regional transmission sectors account for 12 per cent of supply interruptions, with security events[135] accounting 88%.[136]

The Reliability Standard, USE, is targeted to be achieved every year. However compliance is measured over the most recent ten financial years, as it is not possible to guarantee that USE will not exceed 0.002% in any one year. The current Reliability Standard (USE < 0.002%) equates to interruption of supply to every consumer in a NEM region for approximately 10 minutes each year.[137] The Reliability Standard is also used as the threshold at which AEMO may intervene in the operation of the market to ensure sufficient available capacity[138] and is the basis for most modeling and setting of various performance levels by which the NEM is managed [139].

Performance of the NEM against the Reliability Standard for the past 10 years is shown in Table 12 below.

The average annual USE over the past 10 years is within the Reliability Standard of 0.002% for all regions and for the NEM as a whole, however, insufficient generation capacity to meet consumer demand occurred three times from the NEM beginning in 1998 to 30 June 2010. The most recent instance resulted from a heatwave in Victoria and South Australia in January 2009. The USE from these events on an annual basis was 0.0032% for South Australia and 0.004% for Victoria[140].[141] If a similar period of extreme weather were to occur again within three years, then it would be possible that Victoria and South Australia would experience reserve shortfalls and a heightened risk of supply interruption.[142]

Table 12: Unserved energy (USE) in the NEM over the past 10 years[143]

Year	NEM Region					NEM Weighted Average Per Year
	Qld	NSW	Vic	SA	Tas	
2008-2009	0.0000%	0.0000%	**0.0040%**	**0.0032%**	0.0000%	0.0003%
2007-2008	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
2006-2007	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
2005-2006	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
2004-2005	0.0000%	**0.00005 %**	0.0000%	0.0000%	0.0000%	0.0000%
2003-2004	0.0000%	0.0000%	0.0000%	0.0000%	-	-
2002-2003	0.0000%	0.0000%	0.0000%	0.0000%	-	-
2001-2002	0.0000%	0.0000%	0.0000%	0.0000%	-	-
2000-2001	0.0000%	0.0000%	0.0000%	0.0000%	-	-
1999-2000	0.0000%	0.0000%	**0.0004%**	**0.0019%**	-	-
10 Year Average	**0.00000 %**	**0.00000 %**	**0.00044 %**	**0.00051 %**	**0.00000 %**	-

It must be stressed that the Reliability Standard captures only reliability events originating in the generation and inter-regional transmission sectors and thus good performance against this indicator does not necessarily equate to a high level of supply continuity experienced by end-use consumers. An indicator that also encompasses supply interruptions originating in the transmission and distribution sectors, such as SAIDI above, must also be considered.[144] It is worth noting that since 2005 the transmission and distribution sectors have been responsible for the majority of supply interruptions[145].

A shortfall of the USE indicator is that it does not provide information about the frequency of supply interruptions or the impact of any interruption. The difference in actual customer experience is not captured by USE e.g. a similar USE value may be obtained for a small number of customers being impacted to a very large extent as a large number of customers impacted to a small extent.[146]

The AEMC Review of the Effectiveness of NEM Security and Reliability Arrangements in light of Extreme Weather Events stated that “implementation of alternative [reliability] mechanisms is not needed at this stage” and “there is no evidence to suggest that reliability in the NEM has not been achieved with the application of the current Reliability Standard and Reliability Settings”.[147] A similar conclusion is presented in the AEMC Reliability Panel Reliability Standard and Reliability Settings Review with the addition of the possibility of considering USE performance against the Reliability Standard (USE<0.002%) on an annual basis rather than over a ten year rolling average.[148]

Additional recommendations from the AEMC relevant to reliability include monitoring the performance of the NEM's “energy only” market design to ensure it remains resilient and sustainable over time and include this monitoring in the Annual Market Performance Review undertaken by the AEMC Reliability Panel.[149] This is important as currently NEM pays for actual electricity served and not for capacity available.[150]

As reliability USE is calculated and assessed against the Reliability standard, no greater than 0.002% of unserved energy, the indicator has been graded in this report in terms of pass or fail. The weighted NEM average reliability USE in 2008/09 was 0.0003%, which is lower than the reliability standard of 0.002% and thus the NEM receives a **pass** grade for reliability USE in 2008/09.

4.3.2. SECURITY OF SUPPLY – *GRADE C*

KPI: Estimated Security Unserved Energy

AEMO defines security of supply in the NEM as a measure of the power system's capacity to continue operating within defined technical limits even in the event of the disconnection of a major power system element such as an interconnector or large generator.[151] Security events are generally those caused by a rapid disconnection of power system equipment from service due to either equipment failure or the activation of protection systems.[152] Security is the product of the technical performance characteristics of plant and equipment connected to the power system and how AEMO and network service providers operate it.[153] Section 4.5.2 details further discussion on security and how it is differentiated from reliability in the NEM.

AEMO is responsible for maintaining the security of the NEM[154] and is charged with operating the power system within the limits of the technical envelope.[155] Much of the data used by AEMO to ascertain if the NEM is operating in a secure fashion is not publically reported and there is currently no reported overall system wide measure for security of supply. The situation is further constrained by the National Electricity Rules (NER)[156] defining the power system (NEM) as operating in a secure state if the AEMO, in its "reasonable opinion", considers it is secure. Security related data currently reported for the NEM on a recurring basis includes:

- frequency and voltage performance
- power system directions issued by AEMO
- major power system incidents and contingency events
- actual and forecast minimum reserve levels
- maximum demand forecasts and transmission outages
- accuracy of AEMO forecasts (medium term, short term and pre-dispatch)
- reliability measures (SAIDI, SAIFI and CAIDI)

The above data do not provide a system-wide measure of NEM security and no such system wide measure is regularly reported. Security is an important criterion for NEM customers and regular (at least annual) reporting and publication of a NEM wide security indicator, detailing the NEMs current and historical performance is recommended to aid transparency and performance management in NEM security.

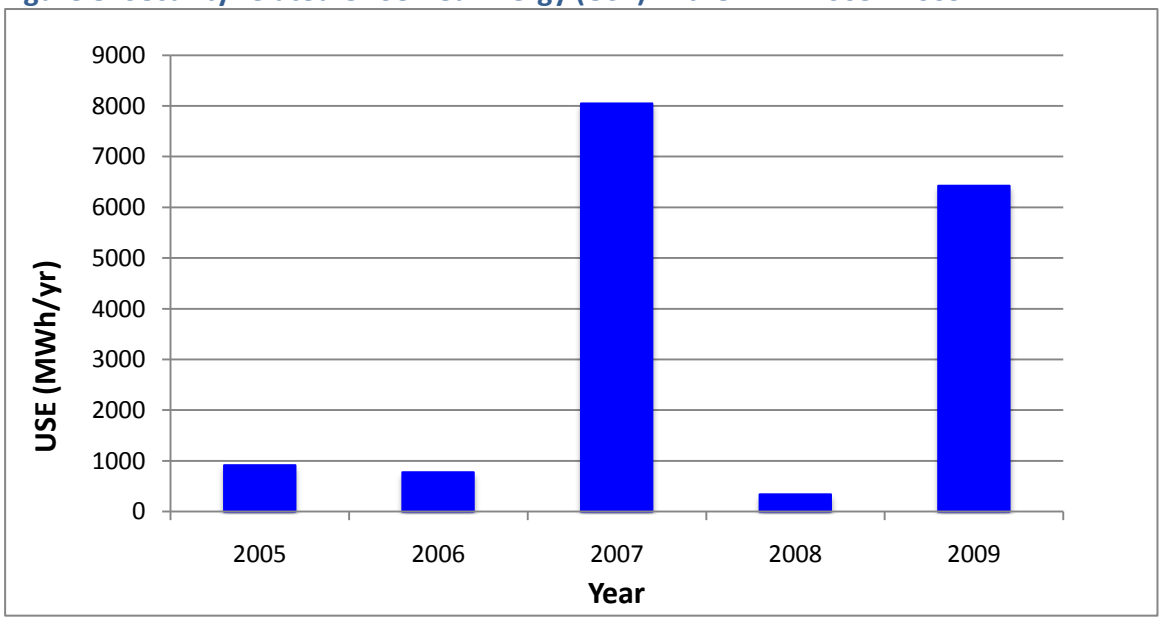
In its 2010 Review of the Effectiveness of NEM Security and Reliability Arrangements in light of Extreme Weather Events, the AEMC reported a differentiated version of the NEM reliability indicator, Unserved Energy (USE), which provides an estimate of the USE caused by security related supply interruptions in the generation and transmission sectors (See section 4.3.1 for a detailed description of reliability USE).

It is understood this estimated security USE is an imperfect measure of system wide security as it relates to generation and inter-regional transmission capacity only, however it is currently the largest scope, security specific metric that is reported publically.

It must be stressed that as the estimated security USE captures only security events originating in the generation and inter-regional transmission sectors and that good performance against this indicator does not necessarily equate to a high level of security of supply experienced by end-use consumers. An indicator that also encompasses security related supply interruptions originating in the transmission and distribution sectors must also be considered.

In addition, a shortfall of the estimated security USE indicator is that it does not provide information on how often supply is interrupted or the impact of any interruption. The difference in actual customer experience is not captured by USE. For example, a similar USE value may be obtained for two events, when one of them has a large impact on each of a small number of customers and the other has a small impact on each of a large number of customers.[157] NEM performance against the estimated Security related USE is presented in Figure 8 for the period, 2005 –2009.

Figure 8: Security related UnServed Energy (USE) in the NEM 2005 - 2009[158]



Owing to an incomplete estimated security USE dataset for 2010, the security of supply USE indicator has been graded using the last full year of data (2009). To aid with grading, a comparison between the (estimated) security of supply USE indicator, and reliability USE (used by the AEMO to measure reliability in the NEM see section 4.3.1) is shown in Table 13. In 2009 it can be seen the (estimated) security USE far exceeds reliability USE, showing

NEM security events are responsible for a far larger proportion of generation and inter-regional transmission supply interruptions than reliability events.

Table 13 Comparison of (estimated) security USE and reliability USE 2005-2009[159]

Year	Estimated Security USE	NEM Electricity Consumption	Estimated Security USE as % of NEM consumption	Reliability USE as % of NEM consumption
Units	**(MWh/yr)**	**(GWh/yr)**	**(%)**	**(%)**
2005	919	202,800	0.0005	0.0000
2006	781	206,400	0.0004	0.0000
2007	8050	208,000	0.0039	0.0000
2008	343	207,900	0.0002	0.0000
2009	6431	206,000	0.0031	0.0003

The comparison in Table 13 is useful in eliciting the types of events responsible for generation and transmission outages. However it must be remembered the two indicators are controlled by different planning and operation mechanisms and are likely to lie at differing levels in an economically efficient NEM.

The (estimated) security USE is graded based on the grading scale shown in Table 14 that benchmarks (estimated) security USE against it historical performance. The lowest (estimated) security USE in the period was awarded a B and the highest a D. This narrowed grading band, with B the best grade and D the worst was utilised owing to the small size and low quality dataset available for (estimated) security USE.

Table 14 Security Unsupplied Energy grading scale

Grade	(Estimated) Security Unsupplied Energy (MWh/yr)
B	<350
C	350 - 8050
D	>8050

Based on the grading scale in Table 14 the NEM scores a **C** for security of supply in 2009.

However, It is stressed that current reporting of NEM security of supply is insufficient and further work is required. Greater transparency and clarity of reporting is recommended including details of indicator calculation and annual public reporting of a specific overall (including the distribution sector) measure of security of supply.

4.3.3. QUALITY OF SUPPLY – *UNGRADED*

KPI: Customer Severity Index (CSI)

In the stakeholder survey, the quality KPI options were not rated highly by respondents. Some survey respondents commented that many customers, particularly residential ones, were unlikely to be aware of whether they are experiencing quality of supply issues, until one or more of their electrical appliances failed. While verified customer quality of supply complaints do provide an indication of more pronounced or protracted quality of supply issues, they do not offer the most efficient or comprehensive method for reporting their occurrence. A more direct and comprehensive indicator for the quality of supply is presented here for the purposes of the Report Card.

Quality of supply relates to the characteristics of the electricity supply delivered to end customers. Poor quality electricity can be likened to a water supply that has low pressure or does not meet water purity standards.[160] Poor quality electricity supply may also inhibit the normal operation of electrical equipment or damage it. The overall quality of electricity supply depends on a number of factors, including the location of your connection to the electricity network, the load type(s) of the surrounding electricity users and the voltage level at which you are connected to the network. As a general rule, the quality of supply is improved by connecting to the network at higher voltage levels and by connecting to networks with lower network exposures.[161]

The factors that affect the quality of electricity supply for an end user include[162]:

- steady state voltage
- supply frequency
- voltage sags
- voltage swells
- voltage transients
- current issues
- harmonic distortions
- radio frequency interference.

It is important to note supply quality issues like voltage “sag” or “swell” may not interrupt the supply of electricity, but for a business customer operating voltage sensitive machines, a sustained partial loss of voltage or voltage sag can cause the same amount of downtime as a complete one hour loss of power.[163] For this reason Electricity Network Service Providers must observe state, territory and national codes, licences and statutes that specifically detail the required performance and nature of electricity supply networks.[164]

Quality of supply and security of supply are related to each other, as a secure network operates within the technical limits prescribed by the AEMO (see section 0) and many of these prescribed technical limits are also measures of the quality of supply. Currently

reported measures relating to the quality of electricity supply in the NEM that are publicly reported[113] and for which data is provided include:

- **frequency** – the number of times the frequency moved outside the normal operating band during the fiscal year and the duration of the excursion.
- **frequency** – the daily standard deviation of frequency on the NEM
- **power systems directions** – number of power systems directions issued during the year (these directions are a power system security safety net mechanisms available to AEMO to issue directions to maintain the power system operating security)
- **power system events** – number and description of power system events.

As the above data reported by the AEMC Reliability Panel does not include a NEM-wide overview of quality of supply, or sufficient data to calculate a KPI for this purpose, quality of supply has not been graded. However, a NEM-wide quality of supply indicator has been developed which has potential to highlight key power quality issues in electricity networks. Developed by the University of Wollongong (UOW) and Energy Networks Australia (ENA), through the Australian Long Term National Power Quality Survey (LTNPQS), the Customer Severity Index (CSI) shows great promise for use in NEM quality of supply reporting. The LTNPQS is a large multi-utility power quality survey that has been in operation for the past 8 years.[165] The LTNPQS provides, among other measures, an overall power quality (PQ) performance indicator, CSI, which can be used to measure utility network performance based on the total impact on a customer due to a combination of four disturbances. The PQ disturbances analysed are steady state voltage, voltage balance, voltage total harmonic distortion (THD) and voltage sag. The UOW considers these voltage disturbances as the key indicators of power quality for Australia at present.[166] The 2008–2009 LTNPQS reports contained data from 540 distinct sites provided by 10 of the 14 electricity distributors across all Australian states. In terms of number of sites, geographic extent and longevity, it is one of the largest power quality monitoring projects in the world.[167]

At least some of the networks already report quality of supply data produced through the LTNPQS. Ausgrid, for example, currently provide data from 37 sites in their network to the LTNPQS and use the results to provide them with network management information.[168] Utility averages can be used to generate year-by-year trends alerting network operators if disturbance levels are increasing and it is apparent that limits may soon be exceeded.[169]

It is beyond the scope of this report to ascertain which NEM networks currently utilise LTNPQS data and report on quality of supply. However it appears that the development and public reporting of NEM regional CSI data and NEM-wide CSI data could allow NEM-wide benchmarking, trend analysis and ultimately a system-wide KPI for measuring the quality of electricity supplied to NEM customers.

For the reasons outlined above, the level of NEM performance for supply quality remains **Ungraded** in this Report Card.

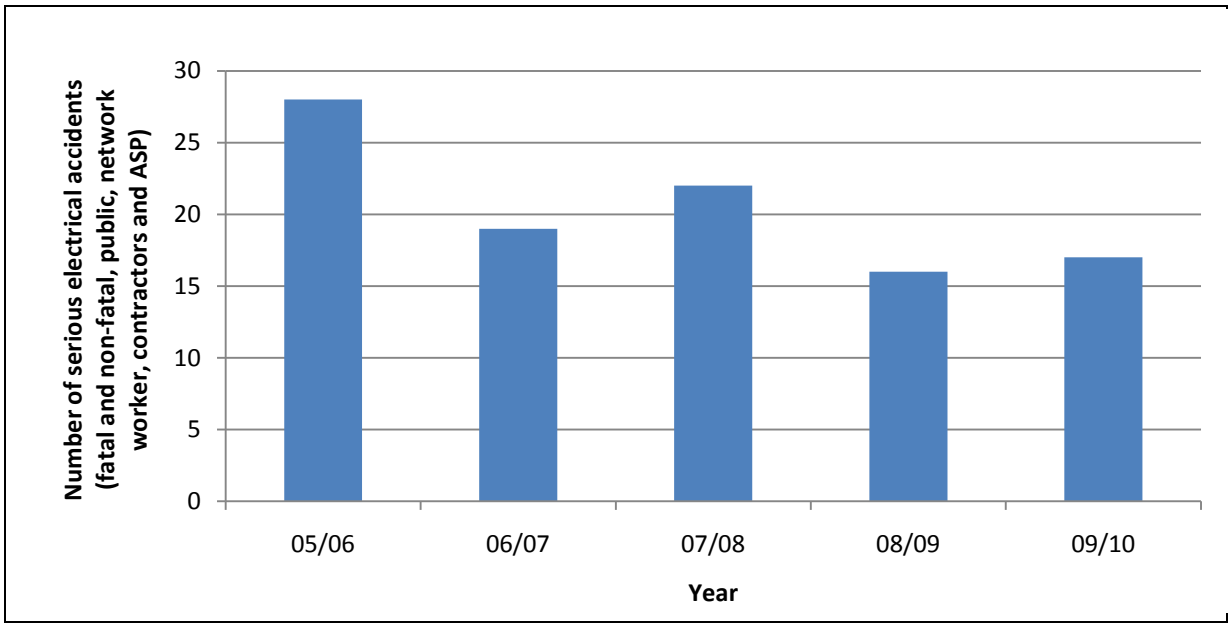
4.3.4. SAFETY – *UNGRADED*

KPI: Lost time injury frequency

It is to be expected that safety is one of the criteria for the long term interests of consumers within the National Electricity Objective. It is essential that Australia's electricity system is as safe as possible for both the public at large and those who work within the National Electricity Market.

Unlike many of the other criteria and associated KPIs in this Report Card which are an outcome of the interaction of behaviour of numerous market participants, primary responsibility for safety lies squarely with the individual businesses within the NEM such as generators and distributors, rather than a NEM coordination body such as AEMO, AEMC or AER. This locates the responsibility for safety in the organisations where a culture of safety is most required. Consequently, most public reporting on safety indicators is undertaken in company annual reports.

Figure 9: Serious electrical network accidents (NSW, 2005 – 2010)[170]



A consequence of safety reporting occurring at a company level is that finding consistent aggregated NEM-wide safety data for the purposes of this Report Card has been difficult. Statutory safety reporting requirements operate at a state level and thus differ from state to state across the NEM. NSW requires the most comprehensive electricity safety reporting of all states. This is done through the NSW Department of Industry and Investment's *Electricity Network Business Safety Reporting Template*.[171] Based on this data, Figure 9 shows a generally declining trend over the past five years in the combined number of serious electrical network accidents from the four NSW Network businesses now called Transgrid, Essential Energy (formerly Country Energy), Ausgrid (formerly Energy Australia) and Endeavour Energy (formerly Integral Energy). This data is from only one

sector of the NEM in one state and is thus insufficient to rate the safety performance of the NEM. Therefore other sources of safety data have been sought to use in this Report Card. However, a similar level of detailed information for electricity network safety has not been found in other NEM states or for other parts of the NEM, such as the generation sector.

The most comprehensive aggregated public reporting of safety indicators found is published by the Energy Supply Association of Australia (ESAA). In the last six Electricity Gas Australia reports, ESAA has reported *lost time injury frequency* – the number of injuries per million hours worked for the transmission and distribution and generation sectors. Additionally, either *days lost due to injury* (days lost per employee) or the *lost time injury severity rate* (days lost per million hours worked) has also been reported for both sectors. These are also the safety KPIs that most electricity companies report on in their annual reports. For the purposes of this report *lost time injury frequency* has been taken as the key safety performance indicator.

Figure 10 and Figure 11 provide state-by-state data of lost time injury frequency. Because the time period covered is so short and the data show a high degree of variability, there is no clear trend evident.

Figure 10: NEM generation sector lost time injury frequency 2004/05-2009/10[172]

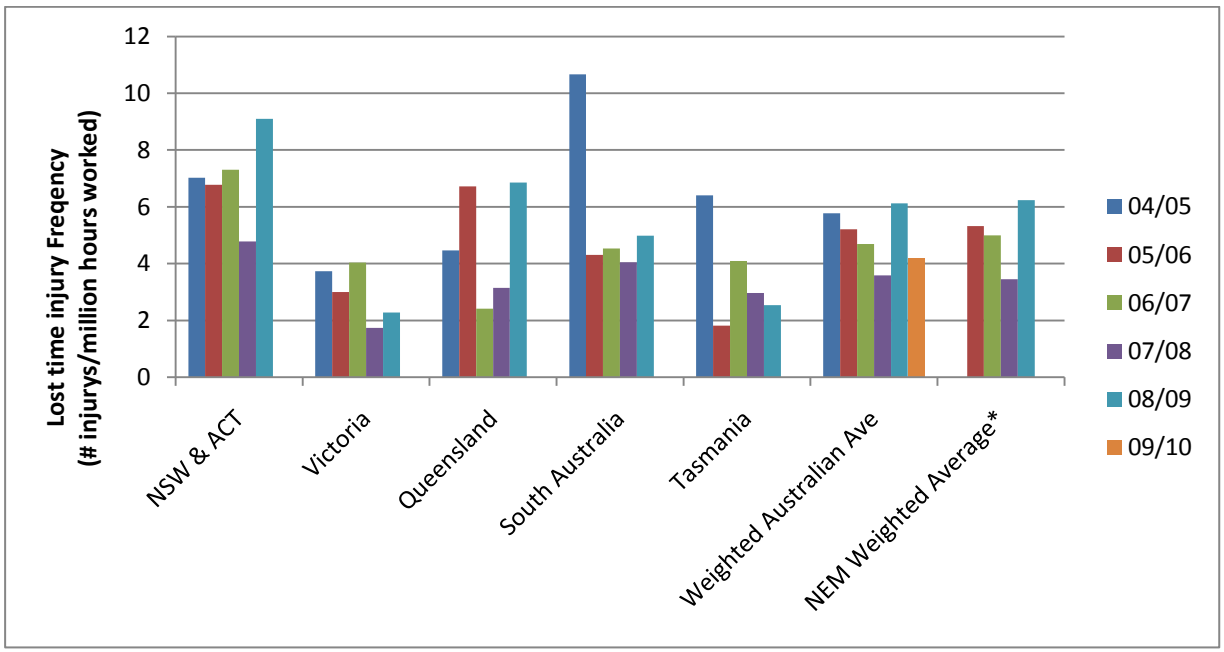
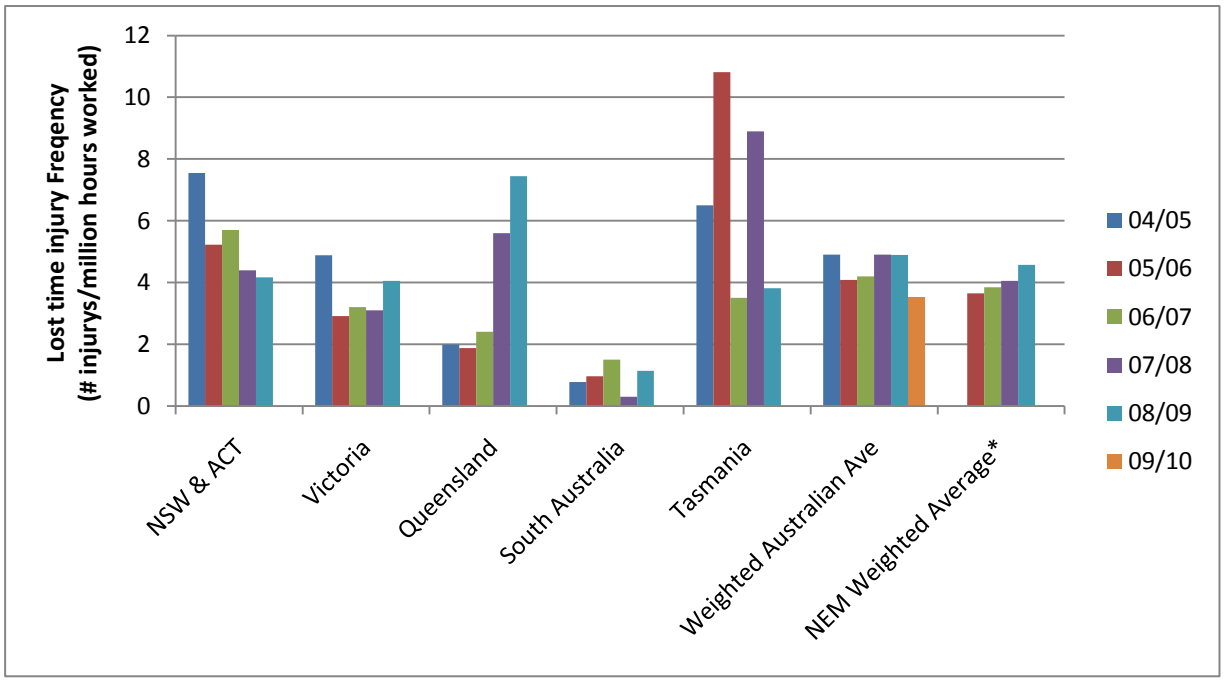


Figure 11: NEM transmission and distribution lost time injury frequency (2004-2010)[173]



*Please note: As data on hours worked in the electricity generation, transmission and distribution sectors is not publicly available, to generate a NEM weighted average for lost time injury frequency, the jurisdictional figures were averaged using ESAA jurisdictional customer numbers data. As customer numbers are far from an ideal proxy for hours worked, it is recommended that in future, data on either total hours worked or a NEM weighted average of lost time injury frequency be reported.

It should also be noted that as of 2009/10, ESAA has started to report an Australian weighted average only and not state-by-state data. The Australian weighted average includes data from both the non-NEM jurisdictions of the Northern Territory and Western Australia. This means that in the future, it will be more difficult to monitor both NEM-wide and jurisdictional lost time injury frequency performance.

As discussed in Appendix A, the preferred approach to scoring KPIs in this Report Card is to benchmark against international data. However, after extensive desktop research, neither comparable international electricity benchmark data nor Australian performance standards for lost time injury frequency were found. Given that no issue is taken more seriously in the industry than safety, the absence of reliable international benchmarks and the difficulty of comparing safety data across different jurisdictions, it is considered inappropriate to provide a grade to the lost time injury frequency KPI and thus to safety criteria. Sound national and/or international benchmarks for the safety performance of the NEM should be developed as a matter of priority.

Therefore, the level of NEM performance for safety remains **Ungraded** in this Report Card.

4.3.5. PRICE – *GRADE C*

Across Australia, there has been significant recent media interest in the price of electricity, particularly for residential consumers. It is thus unsurprising that two price indicators were considered by survey respondents to be important indicators for inclusion in this Report Card and the NEO more generally. However, as discussed in Section 4.5.3, using price as an indicator can have drawbacks and lead to perverse outcomes.

Price performance of the NEM is covered by four KPIs in this report. These different time periods pick up different trends both in the NEM and internationally. Three of the price KPIs are variations of residential retail price over different time periods, but do not cover the significant price increases in 2010–11. The KPIs and grades assigned are shown below.

Table 15: Price performance indicators

KPI	Grade
Retail price of electricity for residential customers 1990–2010	A
Retail price of electricity for residential customers 2010	B
Retail price of electricity for residential customers 2009–2010	D
Retail price of electricity for small business customers 2009-2011	D

Determining the weighting between these four categories is both contentious and ultimately subjective. After internal discussions and conversations with key stakeholders, it was decided that each KPI should be weighted equally for the purposes of this report. Therefore, based on the results in Table 15, the NEM receives a **C** for electricity prices.

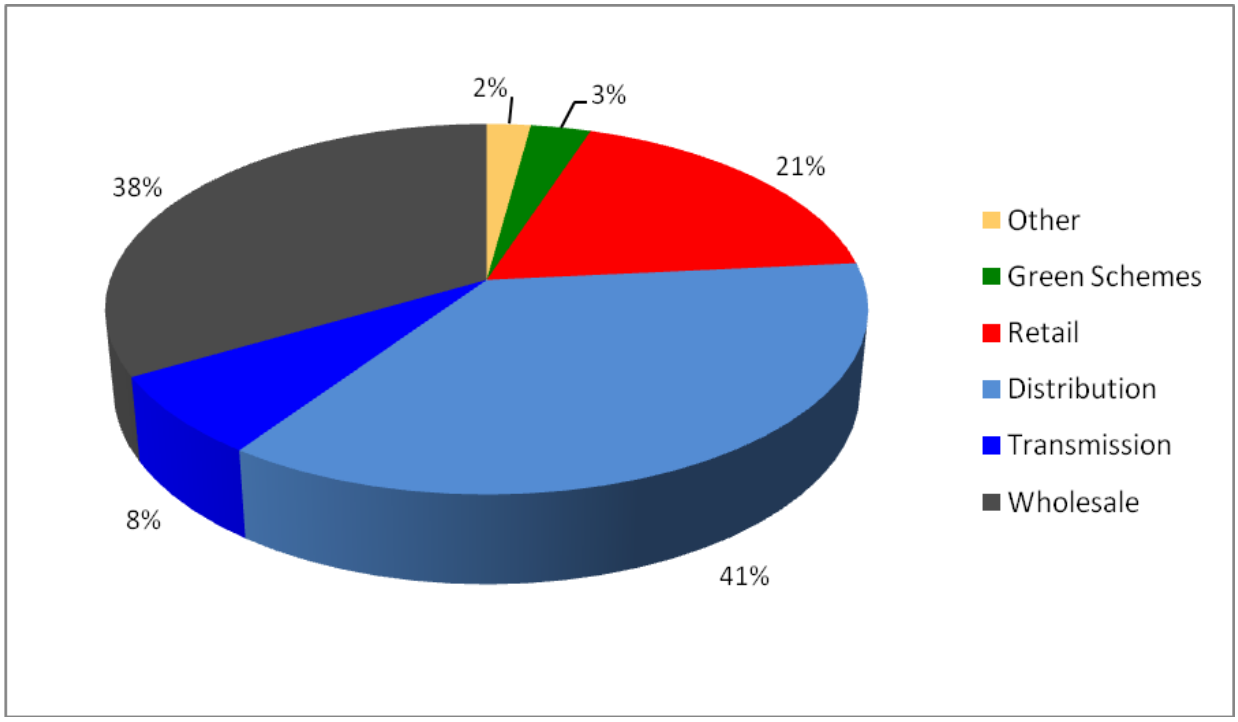
4.3.5.1. RESIDENTIAL ELECTRICITY PRICE – GRADE B

KPI: Retail price of electricity for residential customers (c/kWh)

Australia has historically had low electricity prices by international standards, based in large part on the availability of large reserves of black and brown coal.[174] The price of electricity is already a key indicator within the NEM and most if not all other electricity markets worldwide; as such it is already included as a criterion in the NEO. Electricity prices have been pivotal to electricity market reform and specifically the formation of the NEM. The central feature of the NEM is a wholesale spot market, where electricity is traded at 5-minute intervals. As such, there is a huge quantity of data available for the wholesale price of electricity; however, as the market moves towards full retail contestability and away from state-based regulated retail tariffs, less and less is known about the retail cost of electricity. For example, since 2004 Australia has not reported

industry and household price data to the International Energy Agency (IEA), making it hard to consistently compare retail price information internationally.

Figure 12: NEM average residential retail electricity price by component 2010–11[175]

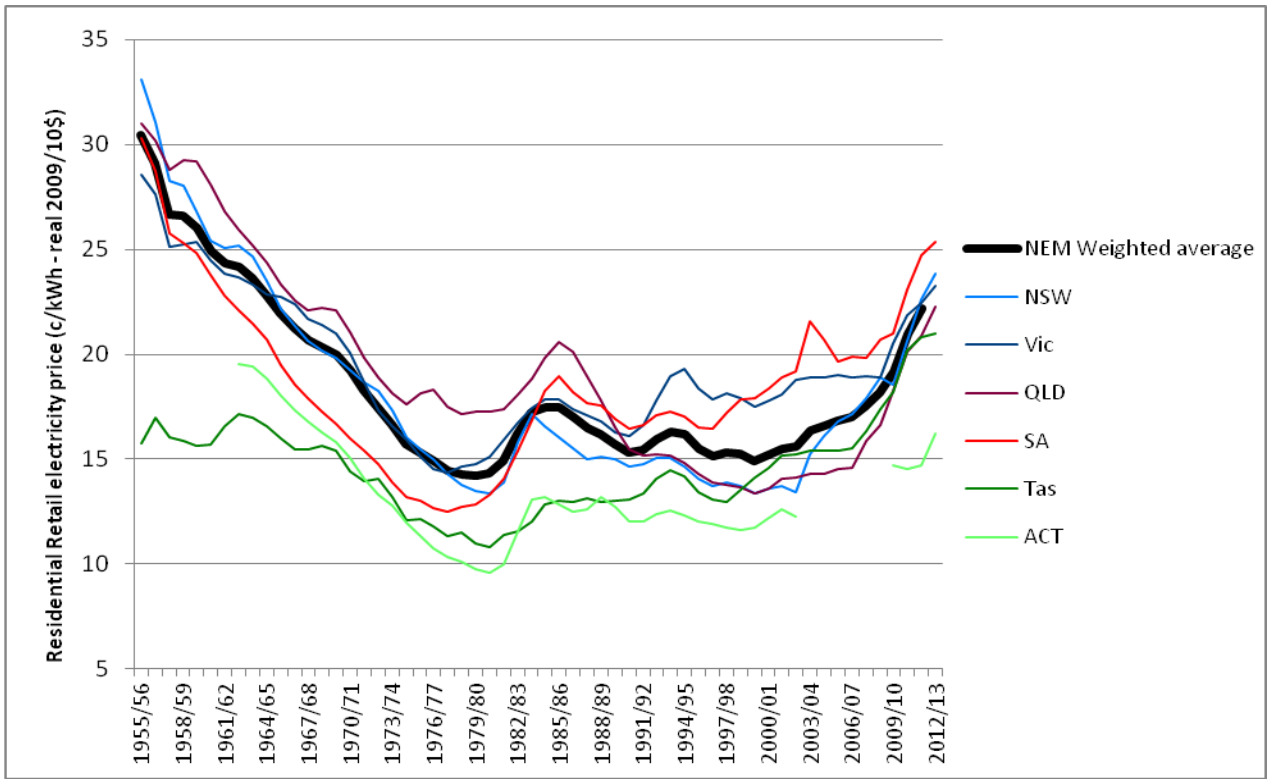


In 2010/11, the average retail electricity tariff in the NEM for residential customers was 21.38c/kWh, up 14% from 18.81c/kWh in 2009/10.[176] Figure 12 shows the breakdown of this price by components, indicating that wholesale and distribution costs contribute the most to residential customers' electricity tariffs.[177] Electricity prices are approaching levels not seen for 50 years (see Figure 13), with price rises of between 20% and 39% across the NEM all but locked in from 2009/10 to 2012/13.[178] In this Report Card, NEM residential electricity prices are compared to OECD residential electricity price performance over three time periods:

- From 1990 to 2010, representing the change in electricity prices from prior to any significant reforms in the Australian electricity system, to the most recent year with available international data;
- Annual change, from 2009–2010, which is the most recent two year period with available international data; and
- A 2010 electricity price snapshot.

These three measures, which equate to three individual KPIs, have been included to draw a comprehensive picture of what is occurring with NEM electricity prices and how they compare internationally. However, as discussed, the primary KPI considered in this report is the 20-year time frame of 1990 to 2010.

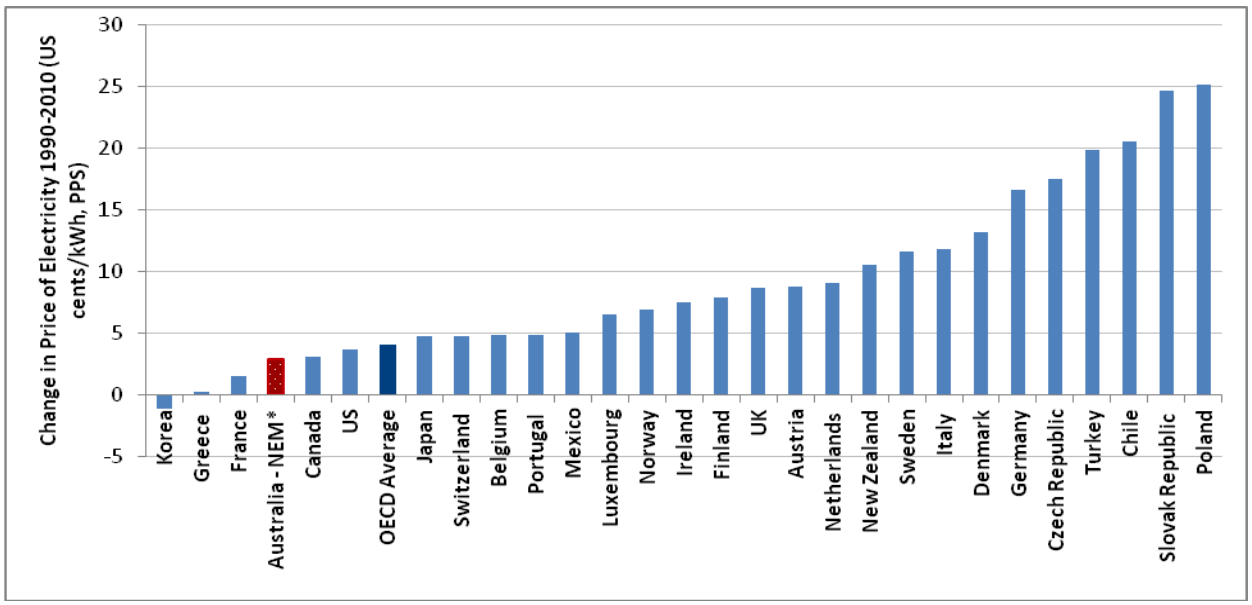
Figure 13: Actual and forecast residential electricity price in NEM states (1955-2013)[179]



NEM residential electricity prices 1990-2010

Since 1990, residential retail electricity prices in the NEM have increased in real terms from an average of 15.3c/kWh[180] to 18.81c/kWh[181] in 2009/10. This represents an average increase of 3.51c/kWh. Internationally, for change in residential retail electricity prices between 1990 and 2010, Australia ranks 4th of the 29 OECD countries for which residential electricity price data are available (Figure 14).

Figure 14: Change in residential retail price of electricity (OECD countries' 1990–2010)[182]



Based on this international comparison, the grading scale is shown below in Table 16. However, it should be noted that as with any comparison of complex systems in different contexts, caution must be applied. This is particularly important as different countries treat externalities such as greenhouse gas emissions in different ways. For example, the EU countries in this comparison have seen significant electricity prices rises with the introduction of the EU ETS in 2005.[183]

Table 16: Change in residential electricity prices grading scale

Grade	Explanation
A	Top 20% of OECD Countries with respect to the change in residential electricity prices 1990–2010
B	In the 60–80% bracket of OECD Countries with respect to the change in residential electricity prices 1990–2010
C	In the 40–60% bracket of OECD Countries with respect to the change in residential electricity prices 1990–2010
D	In the 20–40% bracket of OECD Countries with respect to the change in residential electricity prices 1990–2010
F	Bottom 20% of OECD Countries with respect to the change in residential electricity prices 1990–2010

When a long-term view is taken, the NEM ranks 4th out of 29, with a change in the cost of electricity for residences in the NEM of 2.9cUS/kWh (purchasing power standard). Based on this result, the NEM receives an **A** for Residential Electricity Price.

2010 NEM residential electricity prices

Comparing the current cost of electricity in the NEM to other OECD countries (Figure 15) is also useful, given the current concern about electricity price rises. Based on this comparison, in 2009–10 Australia ranked 8th of the 32 OECD countries for which there is residential electricity price data available. The best performing OECD country is Norway, where a kilowatt hour of electricity costs 9.9cUS (purchasing power standard); while Hungary has the most expensive electricity at 30.8cUS/kWh (purchasing power standard). Based on this international comparison, the grading scale is shown below in Table 17.

Figure 15: Residential retail price of electricity (OECD countries' 2010)[184]

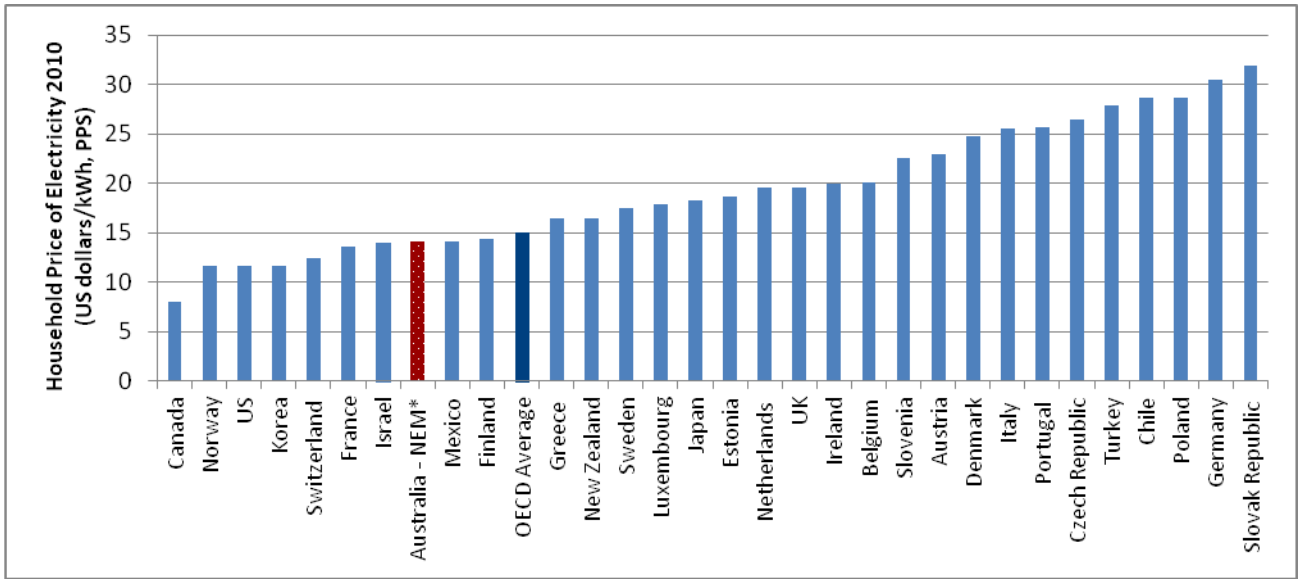


Table 17: Residential electricity prices grading scale

Grade	Explanation
A	Top 20% of OECD Countries with respect to residential electricity price in 2010
B	In the 60–80% bracket of OECD Countries with respect to residential electricity price in 2010
C	In the 40–60% bracket of OECD Countries with respect to residential electricity price in 2010
D	In the 20–40% bracket of OECD Countries with respect to residential electricity price in 2010
F	Bottom 20% of OECD Countries with respect to residential electricity price in 2010

The NEM ranks 8th out of 32 with a cost of residential electricity in the NEM of 13.2cUS/kWh (purchasing power standard). Based on this result, the NEM receives a **B** for Residential Electricity Price.

NEM residential electricity prices 2009–2010

Given that residential electricity prices have been rising significantly in the past few years and that they are projected to keep rising until at least 2015, obtaining data on the most recent annual increase in electricity prices was considered important.

Figure 16 indicates that NEM residential electricity prices have risen by 0.9cUS/kWh, which is the 9th highest electricity price rise in the OECD from 2009 to 2010. Based on this international comparison, the grading scale is shown below in Table 18.

Figure 16: Annual change in residential retail cost of electricity (OECD 2009–2010)[185]

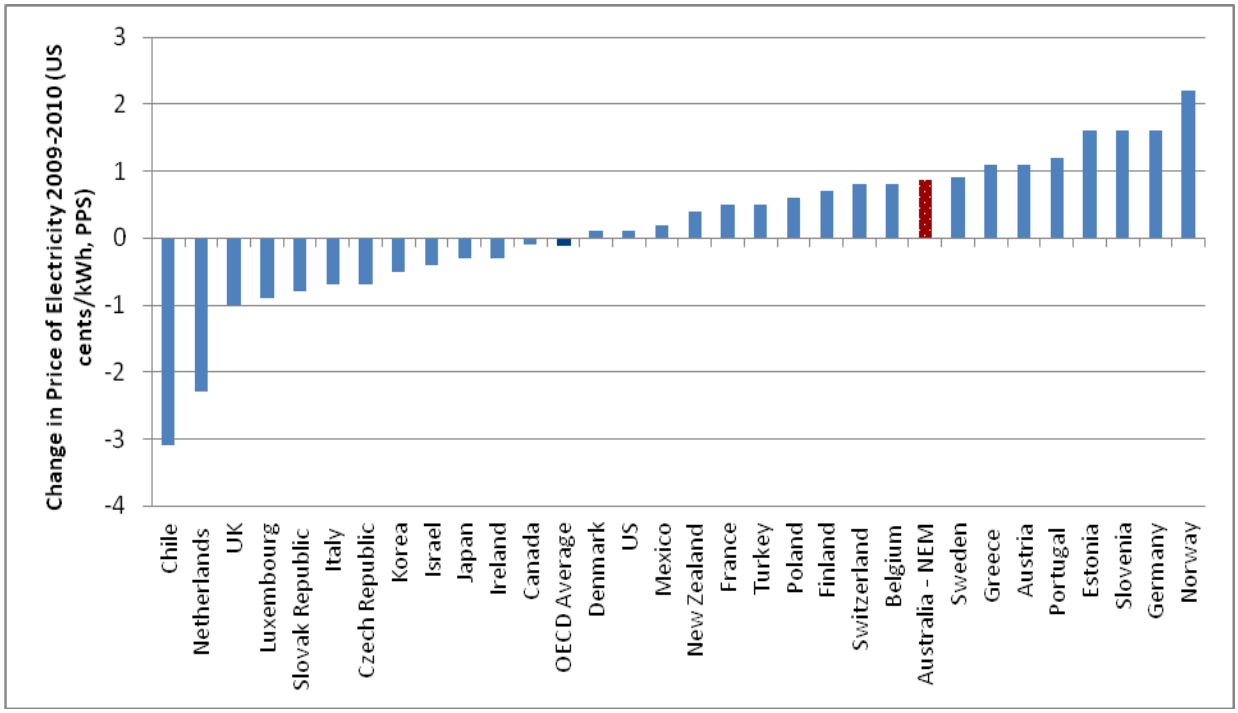


Table 18: Annual change in residential electricity prices grading scale

Grade	Explanation
A	Top 20% of OECD Countries with respect to the change in residential electricity prices 2009–2010
B	In the 60–80% bracket of OECD Countries with respect to the change in residential electricity prices 2009–2010
C	In the 40–60% bracket of OECD countries with respect to the change in residential electricity prices 2009–2010
D	In the 20–40% bracket of OECD countries with respect to the change in residential electricity prices 2009–2010
F	Bottom 20% of OECD Countries with respect to the change in residential electricity prices 2009–2010

For annual change in electricity prices 2009–10, Australia ranks 24th of the 32 OECD countries for which data is available. Based on this result, the NEM receives a **D** for Residential Electricity Price.

However, it should be noted that the period considered does not cover the most recent electricity price rises in 2011. Three grades for residential electricity prices have been given; these are combined with the grade given to the Small Business Retail Price KPI to provide an overall grade for NEM Electricity Prices. What these three indicators illustrate is that while absolute NEM residential electricity prices and the price change over a 20-year period compare positively with international experience, prices are currently rising at a

quicker rate than in most OECD countries. Given that electricity prices are on an upward trajectory in the NEM and the Australian dollar is currently strong, it is likely that the NEM will receive a lower grade in all residential price KPIs in the upcoming years.

4.3.5.2. SMALL BUSINESS RETAIL PRICE – *GRADE D*

KPI: Retail price of electricity for small business customers (c/kWh)

In the NEM, Australia-wide and internationally there is a wide range of metrics reported for non-residential electricity prices. The main ones are business, industrial, commercial and small business prices. The main challenge for this KPI has been to find data for a consistent metric against which to benchmark.

Figure 17: All business electricity price in NEM states 1969–70 to 2009–10[186]

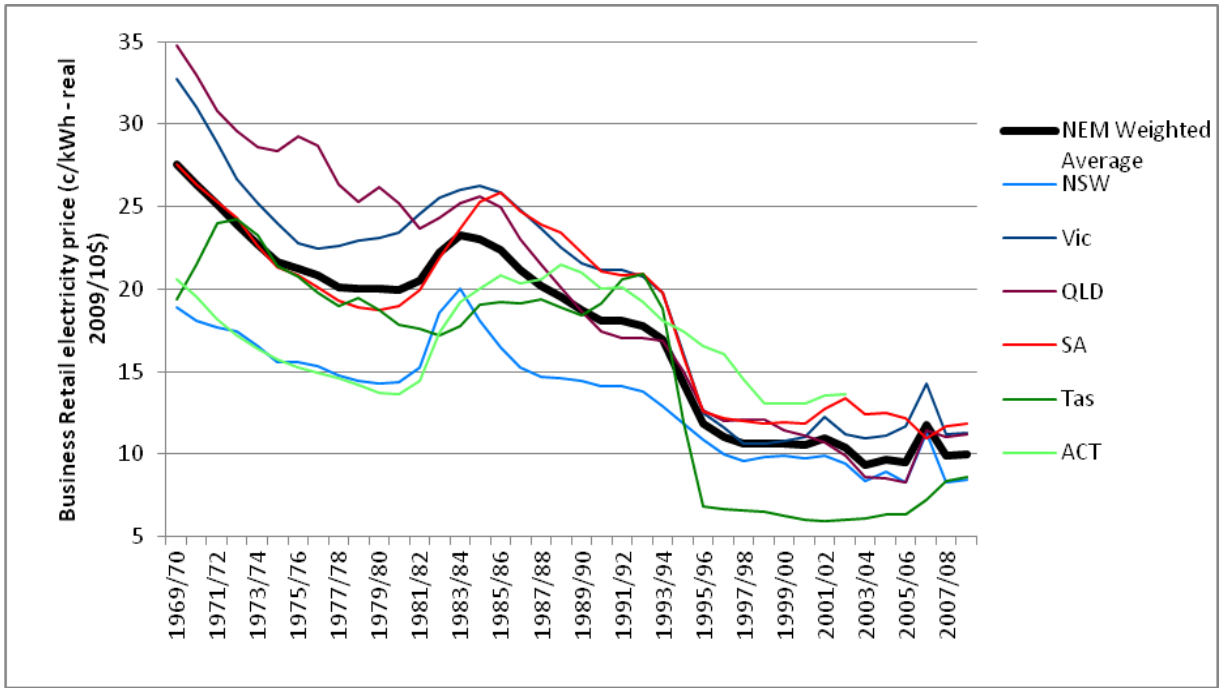


Figure 17 provides a time series of business (combined commercial and industrial) prices in NEM states. It indicates that from 1969–70 business electricity prices declined in real terms until 2008–09 when the NEM weighted average cost of electricity for businesses was 10.02c/kWh[187]. This decline was particularly marked between 1990 and 2009, when compared to international industrial prices [188] over the same period, Australia was placed first of the 20 OECD countries for which there are data (Figure 18). Based on this international comparison, the grading scale is shown below in Table 19.

Figure 18: OECD countries' change in the electricity prices for industry 1990-2010[189]

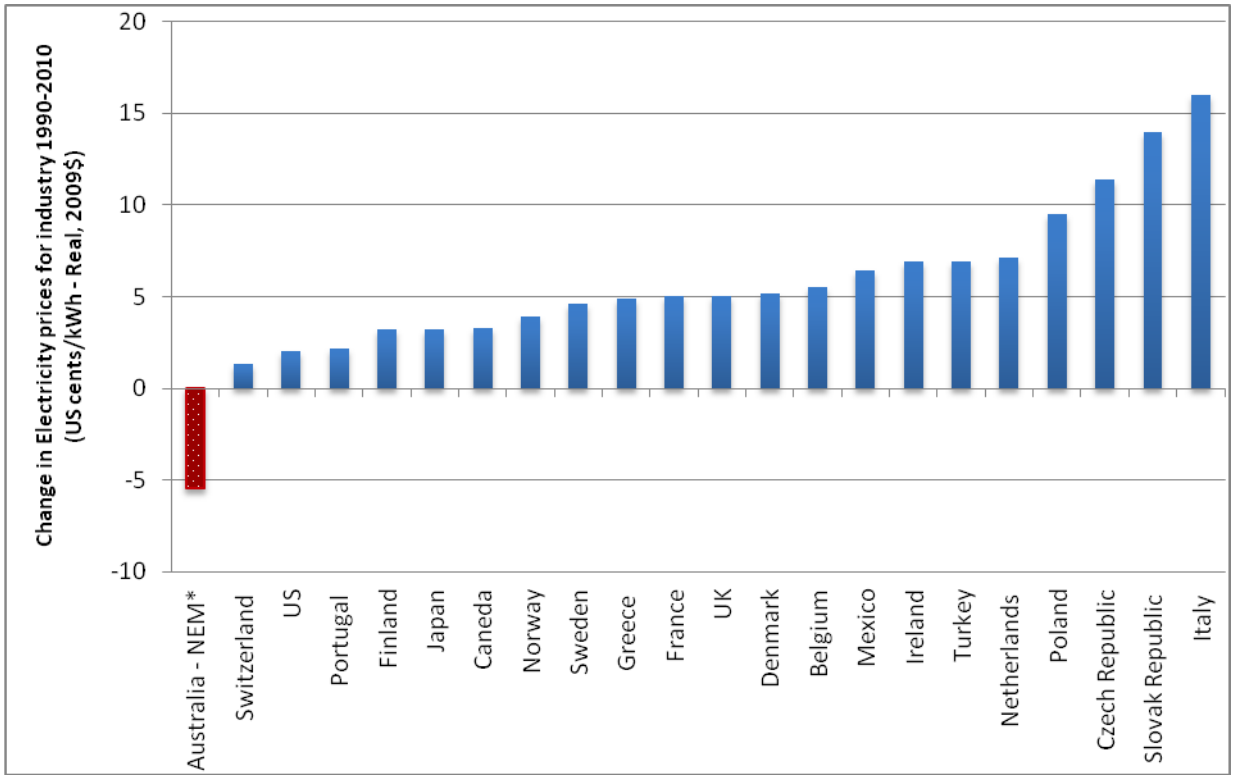
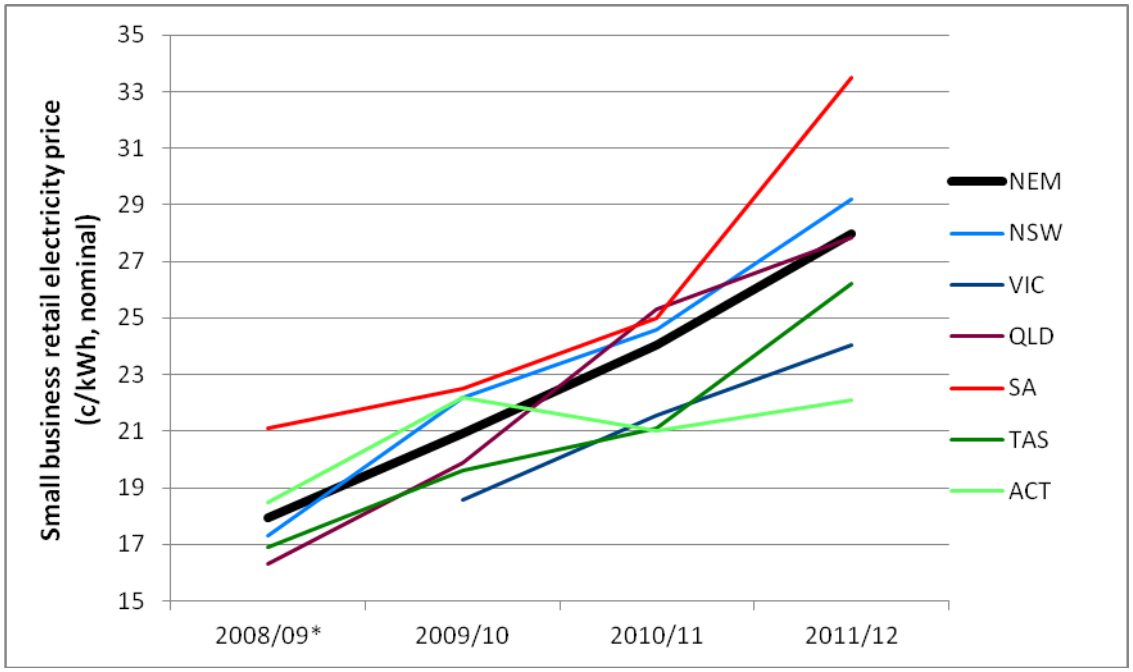


Table 19: Change in industry electricity prices grading scale

Grade	Explanation
A	Top 20% of OECD Countries with respect to the change in industry electricity prices 1990–2010
B	In the 60–80% bracket of OECD Countries with respect to the change in industry electricity prices 1990–2010
C	In the 40–60% bracket of OECD Countries with respect to the change in industry electricity prices 1990–2010
D	In the 20–40% bracket of OECD Countries with respect to the change in industry electricity prices 1990–2010
F	Bottom 20% of OECD Countries with respect to the change in industry electricity prices 1990–2010

Based on this result, the NEM would receive an **A** for Business Electricity Prices. However, neither business nor industry electricity prices discussed above are ***small*** business electricity prices. While it is recognised that large businesses are an important part of the NEM, only one of the five large business consumer groups invited to participate in the stakeholder survey responded. Further, the price of electricity for large business customers was not rated highly as an indicator by survey participants across the board. As such, while Figure 17 and Figure 18 do give an indication of the performance of large business electricity prices, the focus of this KPI is ***small business energy prices***.

Figure 19: Small business standing offer electricity prices in NEM 2008–09 to 2011–12[190]



Both internationally and in Australia there is very little reporting of small business electricity prices. Nevertheless, over the past four years the Office of the Tasmanian Economic Regulator (OTTER) has published small-business standing offer electricity prices for every state and territory in Australia. Their figures are based on combined unit and standing charges for businesses who consume up to 160MWh/year[191]. These state figures, as well as a NEM weighted average[192] are shown in Table 20. It should be noted that standing offers are generally the most expensive offers made, so it is likely that many small businesses will be paying below the prices shown in Figure 19 and Table 20.

Table 20: NEM small business electricity price and comparative increases[193]

	2008/09	2009/10	2010/11	2011/12
NEM Small Business Electricity Price (c/kWh)	17.95	20.90	24.03	28.00
Percentage increase		16%	15%	17%
Producer Price Index (PPI) increase		-0.1%	2.8%	
Consumer Price Index (CPI) increase		2.3%	2.7%	

To give a grade to these figures, the annual percentage change in price was compared to Producer Price Index, as shown in Table 20. As this is not based on an international comparison the grading scale has simpler B–D range as shown below in Table 21.

Table 21: NEM small business electricity price grading scale

Grade	Explanation
B	NEM weighted average small business electricity price declined
C	NEM weighted average small business electricity price stayed steady or increased by less than PPI increase from 2009–10 to 2010–11
D	NEM weighted average small business electricity price increased by more than PPI increase from 2009–10 to 2010–11

The standing offer electricity price for small businesses serviced by the NEM rose by an average of 15% between 2009–10 and 2010–11. Based on this result, the NEM receives a **D** for Small Business Electricity Prices. This reflects the fact that small business prices are significantly higher than for large industry or aggregated business prices and even higher than current residential prices in the NEM. This could be explained by the fact that small businesses tend to use electricity at times of peak demand. They also face significantly higher network tariffs than larger firms that take their supply at higher voltages. A more detailed discussion of electricity prices and bills is given in Section 4.5.3.

4.3.6. CUSTOMER BILLS – *GRADE A*

KPI: Average annual residential customers' electricity bill as a proportion of household expenditure

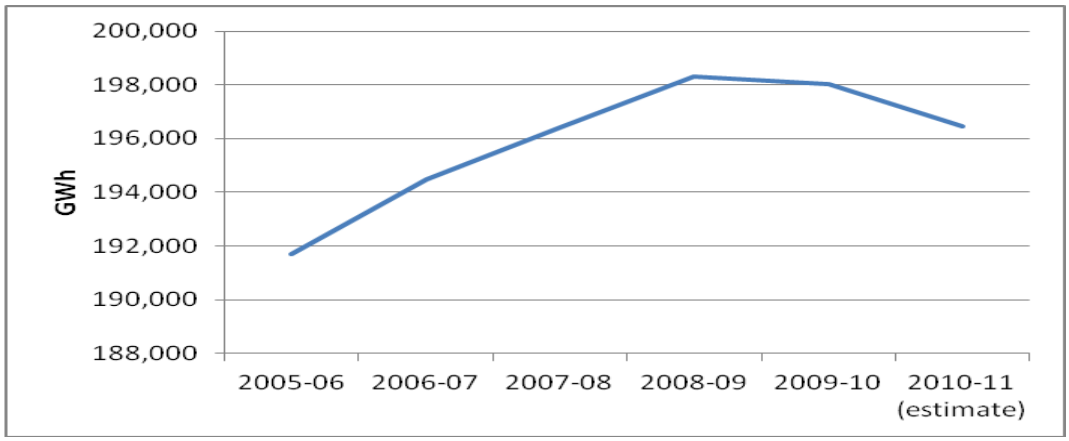
Electricity bills as a proportion of household income was identified by survey respondents as the most important customer bills criterion. However, during the course of this research, more robust household expenditure data has been identified, particularly for the purposes of international benchmarking. As such, this KPI has been modified slightly to look at residential electricity bills as a proportion of household *expenditure* rather than income, although it should be noted that both are discussed below.

These KPIs takes three factors into account at a NEM average level:

- residential retail cost of electricity
- how much electricity households are consuming
- total household expenditure or total household income.

According to the 2009–10 ABS survey of household expenditure, electricity bills currently account for an average of 1.48% of household income, slightly down from 1.53% in 2003–04 (Table 22). (Of all the NEM states, only NSW electricity bills as a proportion of household income went up over this period.) Overall this indicates that the electricity bills (cost of electricity and household electricity consumption) over this period have been rising more slowly than income levels. It should be noted however, that this data does not include the two electricity price rises in July 2010 and July 2011 and it is likely that electricity prices are now rising at a greater rate than income, and while AEMO[194] (see Figure 20) has reported a plateauing or slight decrease in energy consumption this is unlikely to be at a sufficient rate to offset the rising cost of electricity. Thus, if a more recent survey was undertaken it is likely that electricity bills as a proportion of household income would have increased on 2009–10 levels above 2003–04 levels.

Figure 20: NEM-wide electricity consumption 2005–06 to 2010–11[195]



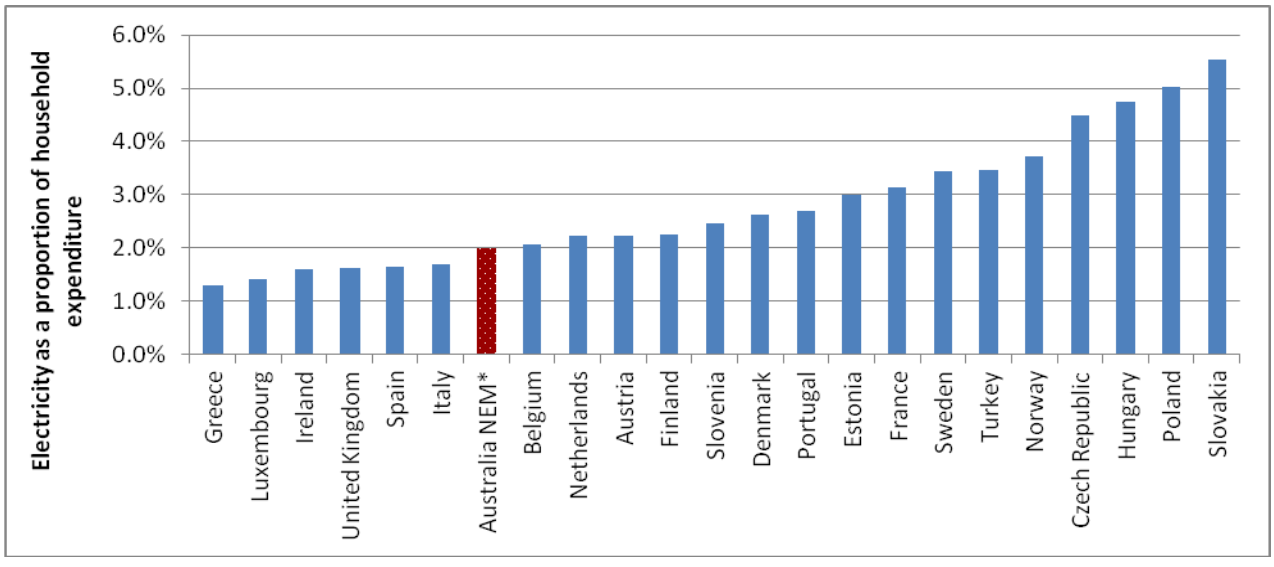
In the period discussed above (2003–04 to 2009–10) electricity bills as a proportion of household *expenditure*, rose slightly on average across the NEM from 1.9% to 2.0%. However, this increase is mainly due to an increase in NSW from 1.7% to 2.0%. In all other states and territories in the NEM, electricity as a proportion of household expenditure either stayed constant or declined as shown in Table 22.

Table 22: NEM states' average electricity bills as a proportion of household Income[196]

	Electricity Bills as a Proportion of Household Income		Electricity Bills as a Proportion of Household Expenditure	
	2003/04	**2009/10**	**2003/04**	**2009/10**
NSW	1.36%	1.49%	1.75%	2.04%
Vic	1.46%	1.36%	1.85%	1.81%
Qld	1.55%	1.47%	1.94%	1.93%
SA	2.03%	1.68%	2.56%	2.40%
Tas	2.68%	2.37%	3.17%	2.91%
ACT	1.43%	1.12%	1.88%	1.70%
NEM Weighted Average	**1.53%**	**1.48%**	**1.93%**	**2.00%**

Figure 21 compares the NEM to the most recently available international data for European OECD countries.[197] Based on this comparison, Australia has the 7th lowest electricity bills as a proportion of household income of 23 countries. However, it should be noted that the EU Emissions Trading Scheme was introduced in 2005, which would affect the comparison and location of Australia within this ranking. Nevertheless, as data could not be sourced for the whole OECD, the European data has been used as a benchmark for this KPI, the grading scale for which is shown below in Table 23.

Figure 21: Electricity bills as a proportion of household income (NEM vs Europe)[198]



*Note, NEM data is for 2009/10, while the European data is for 2005.

Table 23: NEM electricity bills as a proportion of household income grading scale

Grade	Explanation
A	Top 20% of OECD Countries with respect to the change in industry electricity prices 1990–2009
B	In the 60–80% bracket of OECD Countries with respect to the change in industry electricity prices 1990–2009
C	In the 40–60% bracket of OECD Countries with respect to the change in industry electricity prices 1990–2009
D	In the 20–40% bracket of OECD Countries with respect to the change in industry electricity prices 1990–2009
F	Bottom 20% of OECD Countries with respect to the change in industry electricity prices 1990–2009

Based on this result, the NEM receives a **B** for electricity bills as a proportion of household expenditure.

4.3.7. ENVIRONMENTAL PERFORMANCE – *GRADE F*

Environmental performance was chosen by survey respondents as the most important new criterion to include in the NEO. It was also selected as the criterion in which the NEM is performing the most poorly. Furthermore, as discussed in more depth in Section 3.2.2 of this report, environmental criteria have previously been included in Australian electricity market objectives.

Environmental performance of the NEM is covered by three KPIs in this report. The KPIs and grades assigned are shown below in Table 24.

Table 24: Environmental performance indicators

KPI	Grade
Greenhouse Gas Emissions	F
Greenhouse Gas Intensity	F
Renewable Energy	D

Determining the weighting between these three categories is both contentious and ultimately a matter of judgement. After internal discussions and conversations with key stakeholders, it was decided that each KPI should be weighted equally for the purposes of this report. It should be noted however an alternative weighting would probably not result in a different overall score.

Therefore, based on the results in Table 24, the NEM receives an **F** for environmental performance.

4.3.7.1. GREENHOUSE GAS EMISSIONS – *GRADE F*

KPI: Annual greenhouse gas emissions from the electricity sector (tonnes CO2-e/year)

The majority of survey respondents agreed that greenhouse gas (GHG) emissions are an important indicator of the long term interests of consumers. This line of thought has been stated internationally in recent forums such as by the UK Parliament:

> *The interests of gas and electricity consumers are their interests taken as a whole, including their interests in the reduction of greenhouse gases ...*[199]

The written responses in the survey were also dominated by calls for the inclusion of sustainability criteria in the evaluation of the NEM with 25% of respondents who suggested alternative criteria directly mentioning GHGs and 83% mentioning sustainability.[200]

As recently as 2006, the official position of the federal government was that along with the objective of promoting the long term interests of consumers, it was important to 'address greenhouse gas emissions from the energy sector'.[201]

GHG emissions from electricity generation in the NEM have continued to increase each year from 118.1 Mt in 1990 to 187.3 Mt in 2009 at an average rate of 2.4% per annum.[202] As of 2009, the emissions in the NEM comprised 45% of the emissions from energy and 31% of the total emissions in Australia[203] making it the largest source of GHG emissions in Australia. Emissions growth by state is shown in Figure 22 below.

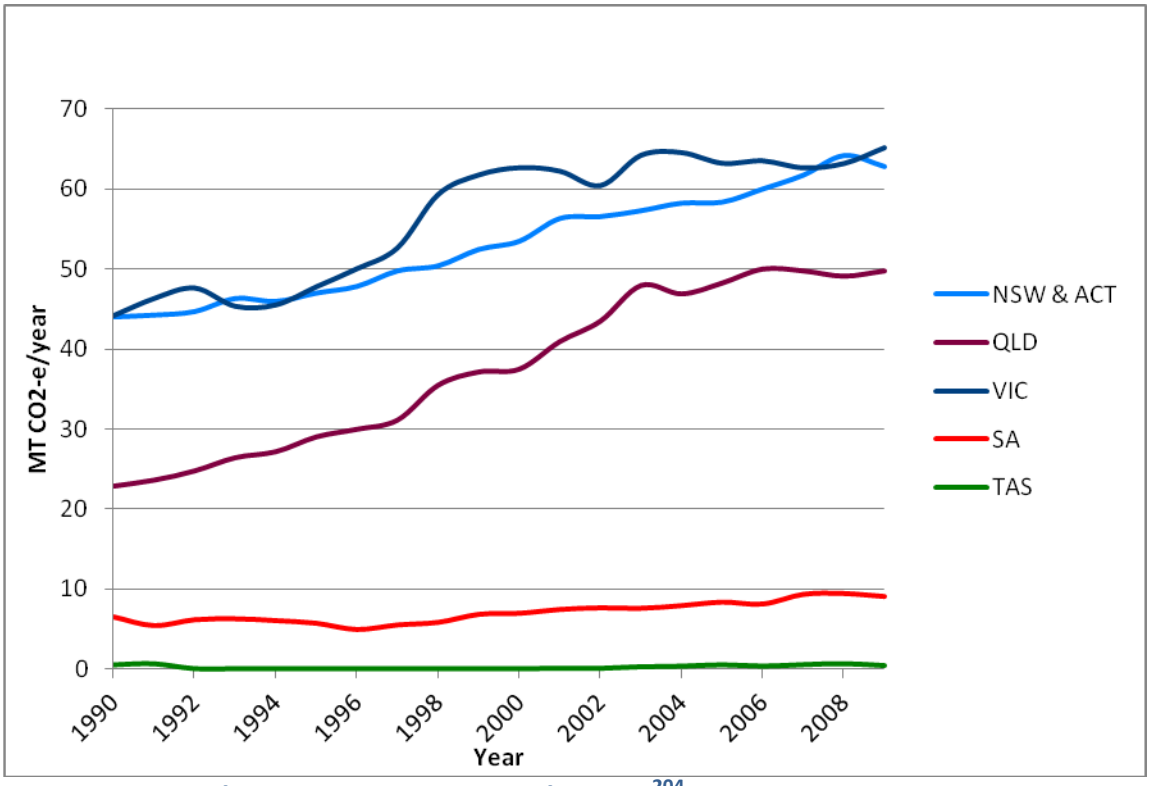
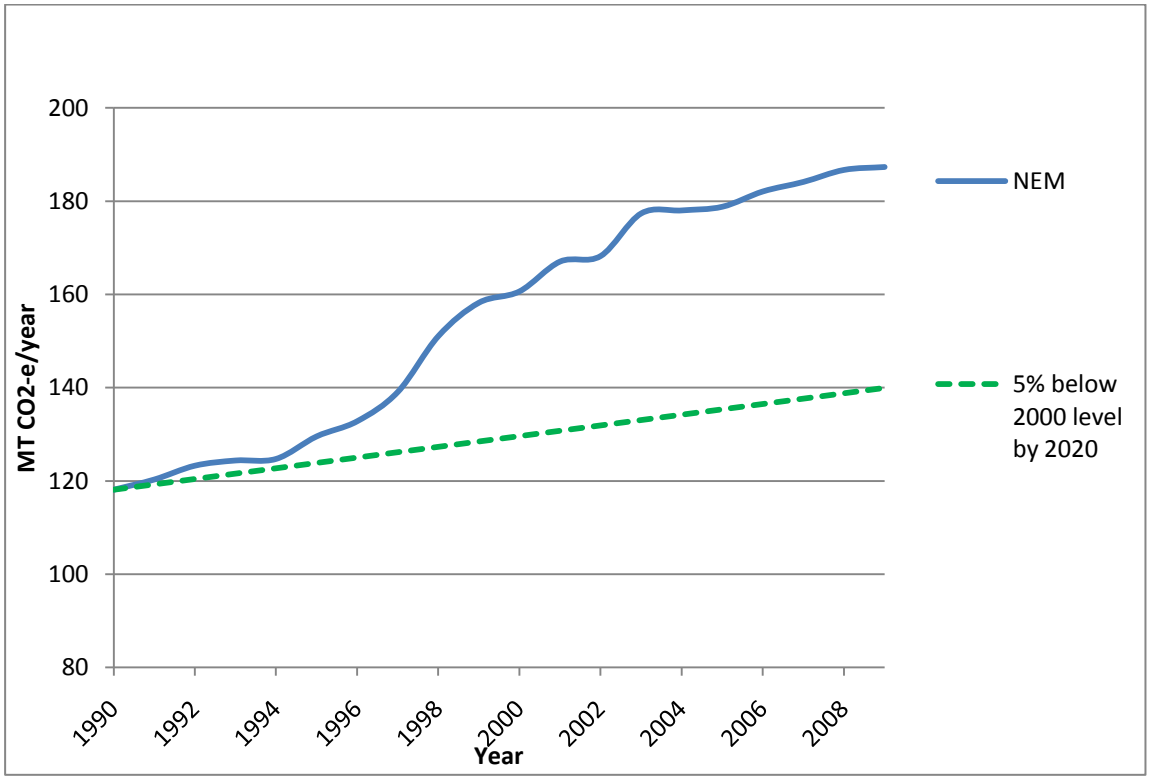


Figure 22: Greenhouse Gas emissions in the NEM[204]

The Commonwealth government has committed to a 5% reduction[205] in national GHG emissions by 2020 from 2000 levels[206] and this has been used as the proxy baseline target for the GHG emissions from electricity generation in the NEM KPI[207] as shown in Figure 23. This target would require an average annual reduction of 0.24% and would reduce emissions from 160.6 Mt in 2000 to 152.6 Mt in 2020. This approach to this KPI was taken due to a lack of targets specific to the electricity industry as the current Australian policy framework rejects the idea of industry-specific targets. However, it is noteworthy that electricity sector specific emissions target have applied in NSW since 1997 through the NSW Greenhouse Gas Abatement Scheme and its predecessor benchmarks scheme. The

GHG target used in this report provides a proxy benchmark against which to grade performance and is not being suggested as official government policy. As the electricity industry makes up such a large proportion of Australian emissions, emissions from this area will need to be reduced if Australia's domestic emissions are to be significantly reduced. Note the 5% reduction from 2000 level target (green dotted line) has been back cast from 2000 to 1990 to provide a longer time series over which trend may be more clearly identified.

Figure 23: NEM Greenhouse gas emissions compared to Australian target



Looking at this from the perspective of the NEM, emissions could be allowed to grow under this target from 118.1 Mt in 1990 at a rate of 0.82% per annum until 2020.[208] However, emissions from the NEM have actually increased at a rate of 2.28% per annum. Based on this, the grading scale is shown below in Table 25.

Table 25: GHG emissions grading scale

Grade	Explanation
A	Emission growth trajectory significantly lower than 2020 target trajectory
B	Emission growth trajectory meets or lower than 2020 target trajectory
C	Emission growth trajectory above 2020 target trajectory but within 50%
D	Emission growth trajectory 50% to 100% above 2020 target trajectory
F	Emission growth trajectory more than twice 2020 target trajectory

Emissions grew from 118.1Mt in 1990 to 187.3Mt in 2009, 2.7 times the rate required to meet the Commonwealth target of 152.6 Mt CO_2e by 2020. Based on this result, the NEM receives an **F** for GHG emissions.

4.3.7.2. GREENHOUSE GAS INTENSITY – *GRADE F*

KPI: Greenhouse gas intensity of electricity supply (kg CO2e/MWh)

While annual GHG emissions was ranked as the second most important indicator of NEM performance by the survey respondents, GHG intensity was ranked as the next most important. As stated by Garnuat,[209] "Australia's unusually emissions-intensive electricity sector is the main reason why Australia's emissions per person are exceptionally large".

The emissions intensity of Australia's electricity supply is the highest of any OECD country. It is 98% higher than the OECD average, and 74% higher than the world average. Emissions in the NEM alone comprised 31% of Australia's total emissions.[210] This is primarily a result of Australia's continued reliance on coal fired power generation, intensified by the brown coal fired power plants in the NEM.[211] This can be seen in the intensity figures shown below inTable 26 where the NEM[212] is compared to the world average.[213]

Table 26: Greenhouse Gas Emission intensity in the NEM and the world

Year	NEM Energy Supply (GWh)	Emissions (Mt CO_2-e)	NEM Intensity (g CO_2-e/kWh)	World Ave. Intensity (g CO_2-e/kWh)	Difference
1990	117.984[214]	118.1	1001		
2004	186,246	178.0	956	500	91%
2005	191,598	178.8	933	500	87%
2006	194,107	182.1	938	501	87%
2007	195,376	184.1	942	507	86%
2008	197,187	186.7	947	502	89%
2009	198,005	187.3	946		

While an attempt was made to assess changes in the NEM emission intensity from 1990 against a national target or appropriate international benchmark, no national targets exist and data was not located as far back as 1990 for the purpose of international benchmarking. Given this, the most recent available data was used to compare the NEM against world averages.

As electricity production makes up such a large percentage of both Australian and world GHG emissions, GHG intensity of electricity production will need to be decreased to make

significant reductions in total GHG emissions. This will require Australia to reduce its emissions intensity to bring it closer to the world average emissions intensity. At the same time, as Australia reduces its emissions intensity, other countries both above and below the world average intensity need to commit to decreasing their own GHG intensities. The principle of contraction and convergence was described in the recently released Garnaut Report[215] with a convergence date of 2050 at levels similar to those of developing countries today.[216] This would require a reduction of 90% by 2050 to stabilise GHGs at 450ppm according to the earlier Garnaut Report.[217] Based on this, a grading scale is show below in Table 27.

Table 27: GHG emissions grading scale

Grade	Explanation
A	Less than world average
B	Close to world average
C	Above world average but falling at a rate to meet world *allowable* average by 2050
D	Above world average and falling at a rate of at least half of what is required to meet world *allowable* average by 2050
F	Above world average and falling at a rate less than half of what is required to meet world *allowable* average by 2050.

The GHG intensity of electricity supply in the NEM fell from 1001 g CO_2-e/kWh in 1990 to 946 g CO_2-e/kWh in 2009 at a rate of 0.3% per annum. The rate required to meet the world allowable average by 2050 is a reduction of 5.93% per annum. Therefore, the electricity intensity of the NEM is only falling at 5% of the rate required to meet an allowable world average by 2050.

Based on this result, the NEM receives an **F** for GHG emission intensity of electricity supply.

4.3.7.3. RENEWABLE ENERGY – *GRADE D*

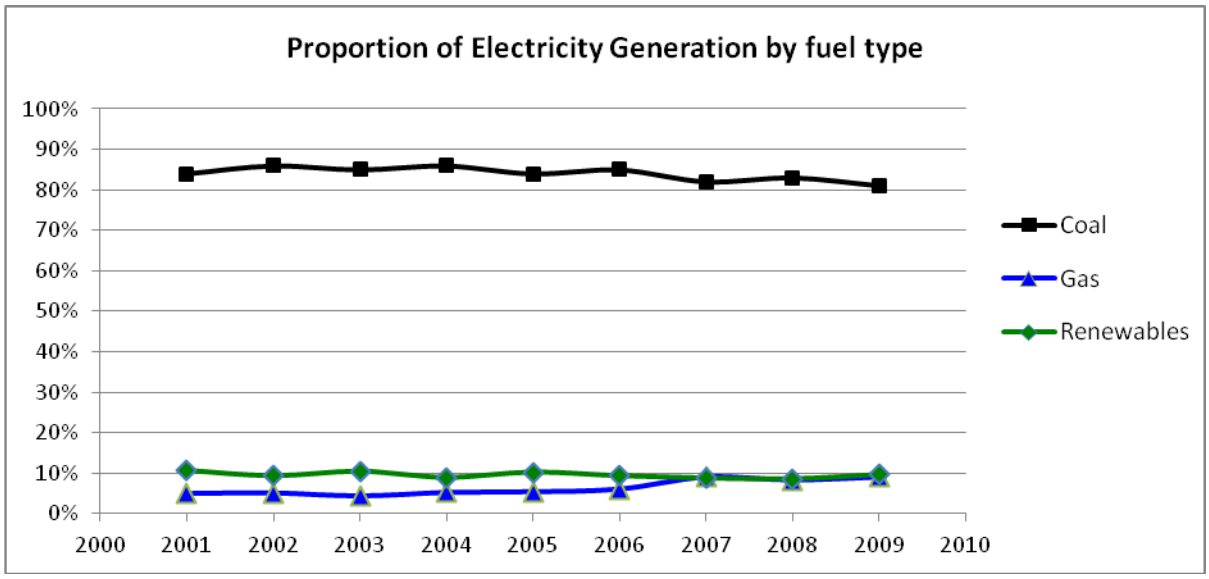
KPI: Renewable energy as a proportion of total electricity generation (% of total MWh)

The majority of survey respondents agreed that the proportion of electricity generated from renewable sources in the NEM is an important indicator representing the long term interests of consumers.

The proportion of electricity generated from renewable energy sources has remained relatively stable in the NEM in the last decade, as shown in Figure 24 below. This is despite the introduction in 2001 of a 2% Mandatory Renewable Energy Target by 2010[218] on top of the 1997 baseline.[219] As of 2009, the proportion of renewable energy in the NEM was 9.6%.

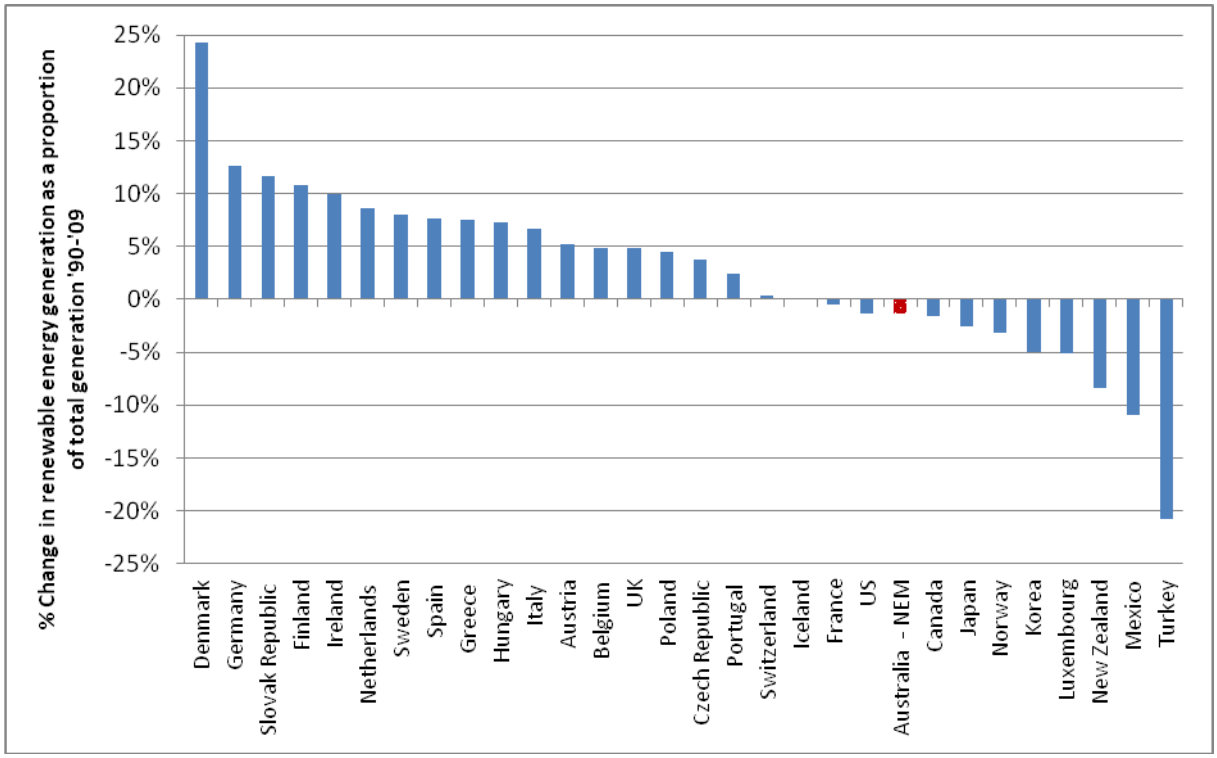
The slight decline in the late 2000s can be attributed to drought conditions reducing the generating capacity of hydro-electric power plants.

Figure 24: Proportion of renewable energy in the NEM[220]



Since 1990, the proportion of renewable energy generation in NEM states has declined by -1.4% from 11%.[221] Internationally, Australia ranks 20th of the 30 OECD countries in terms of change in the proportion of electricity generated from renewable sources between 1990 and 2010[222] (Figure 25). The best performing OECD country is Denmark, which increased its proportion of renewable energy generation by 24.3%. The worst performing OECD country is Turkey, which saw the proportion of renewable energy electricity generation decline by 20.8% from 40.4% to 19.6% over the same period. The OECD weighted average change in proportion of renewable electricity generation is -0.1%.

Figure 25: OECD countries' change in the proportion of renewable energy 1990-2009[223]



The change in renewable energy proportion between 1990 and 2009 was chosen as the benchmark because rather than being a measure of a nation's natural endowment in renewable energy sources (particularly hydro power), this indicator is a measure of the trend in the proportion of energy generated from renewable sources. Further, the time period indicates how electricity market reform and the establishment of the NEM which occurred during the 1990s have affected renewable energy generation. The grading scale for this benchmark is given in Table 28.

With a rank of 20 out of 30, and a change in proportion of -1.4% Australia is in the bottom 20–40% of OECD countries. Based on this result, the NEM receives a **D** for Renewable Energy.

Table 28: Renewable energy proportion grading scale

Grade	Explanation
A	Top 20% of OECD Countries with respect to the change in proportion of electricity generated by renewable sources 1990–2009
B	In the 60–80% bracket of OECD Countries with respect to the change in proportion of electricity generated by renewable sources 1990–2009
C	In the 40–60% bracket of OECD Countries with respect to the change in proportion of electricity generated by renewable sources 1990–2009
D	In the 20–40% bracket of OECD Countries with respect to the change in proportion of electricity generated by renewable sources 1990–2009
F	Bottom 20% of OECD Countries with respect to the change in proportion of electricity generated by renewable sources 1990–2009

4.3.8. ENERGY EFFICIENCY - *GRADE D*

KPI: Electricity savings from utility energy efficiency programs as percentage of total electricity consumed (% of total MWh)

Improving end use energy efficiency has large potential to save money and reduce GHG emissions. It can also increase energy security and reduces the strain on network infrastructure. Energy efficiency investments are often cost negative – the value of energy savings exceed the upfront cost. A UN Foundation Report (2007) stated, 'only energy efficiency can generate nearly immediate results with existing technology and proven policies and do so while generating strong financial returns'. Recently, 'The Prime Minister identified energy efficiency as a key plan in the Government's suite of polices to reduce emissions'.[224] Energy efficiency (EE) is 'widely believed to be the quickest, simplest and most cost-effective way to reduce Australia's greenhouse gas emissions'. [225] The Government's recently released Clean Energy Future Plan includes energy efficiency in homes, offices and factories as one of the four key initiatives. As stated directly in the NEO, the NEM has been tasked with promoting the efficient 'use of electricity services for the long term interests of consumers of electricity'.

Energy efficiency programs have been developed both within and external to the formal NEM structure. Measures developed outside the National Electricity Rules but delivered by parties within the NEM include state level initiatives, such as the Victorian Energy Efficiency Target (VEET), the New South Wales Energy Savings Scheme (ESS) and the South Australian Residential Energy Efficiency Scheme (REES). Other energy efficiency initiatives that are applied and delivered outside of NEM institutions include the Federal Government led Energy Efficiency Opportunities (EEO) program, the National Home Energy Rating Scheme (NatHERS), appliance energy labelling programs, Minimum Energy Performance Standards (MEPS) and the National Framework for Energy Efficiency (NFEE). Under stage two of the NFEE, the following five measures are being delivered:[226]

- Expanding and enhancing the Minimum Energy Performance Standards (MEPS) program.
- The heating, ventilation and air conditioning (HVAC) high efficiency systems strategy.
- Phase-out of inefficient incandescent lighting.
- Government leadership though green leases.
- The development of measures for a national hot water strategy, for later consideration.

There is evidence that these programs are having an impact. Per capita electricity consumption has fallen since 2005/06, while total electricity consumption in the NEM has

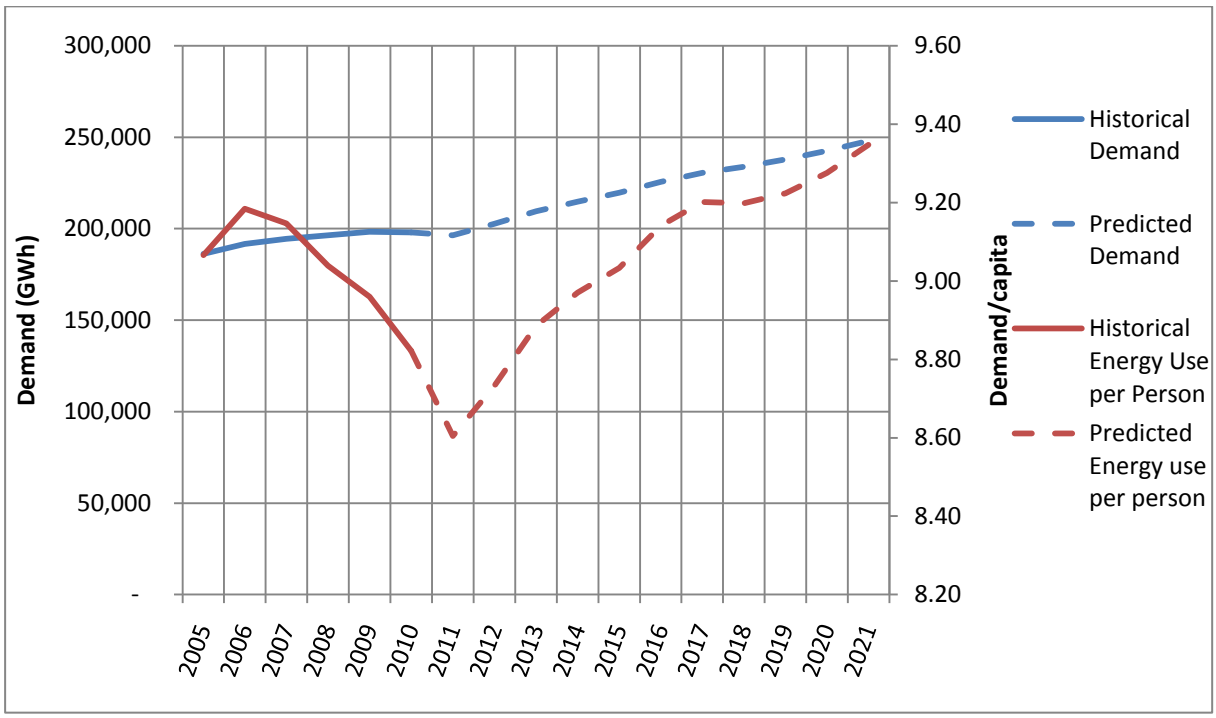
plateaued and fallen since 2008/09. However, these trends are also likely influenced by the significant rise in electricity prices in recent years. Energy use by year is shown below in Table 29.

Table 29: NEM Energy Use[227]

Financial year	Energy Use (GWh)	Change from previous year	Energy Use per capita (MWh/person)
2004/05	186,246		9.07
2005/06	191,710	2.9%	9.18
2006/07	194,487	1.4%	9.15
2007/08	196,428	1.0%	9.04
2008/09	198,295	1.0%	8.96
2009/10	198,023	-0.1%	8.82
2010/11 (est)	196,440	-0.8%	8.60

This information is also shown in Figure 26 below with forecasts out to 2021. From this figure, it is clear that while energy use in the NEM has fallen off in the past year, it is forecast to resume its historical growth trend.

Figure 26: Energy Demand to 2021



A recent report for the Australian Alliance to Save Energy (A2SE) surveyed the electricity network service providers (NSPs) to determine energy savings from various programs.[228] Note that these savings are only those from NSPs and do not include energy efficiency programs from retailers or any other entities within the NEM framework. Furthermore,

these savings are not necessarily a direct result of the NEM framework, but represent energy efficiency being undertaken in NEM jurisdictions. While the A2SE survey respondents only provided limited data on six EE projects, energy savings information was reported for five of the six. These six projects included three efficient lighting projects, one improved hot water system project and two mixed energy efficiency initiatives targeting 2.37 million customers.

In addition the NSP programs, programs facilitated by retailers include the Residential Energy Efficiency Scheme (REES) in South Australia, the NSW Energy Savings Scheme (ESS) and the Victorian Energy Efficiency Target Scheme (VEET). While the ESS reports energy savings directly[229], REES and VEET report savings in terms of GHG reductions only over the life of the end use measure. In order to convert this into an annual energy savings, the value in tonnes of CO2-e must first be converted to kWh using the state based full fuel cycle emissions factors[230] and then the energy savings must be spread out over the life time of the measure. For the purposes of this report, in the absence of more specific data, an average lifetime of five years has been assumed. This assumed medium-term lifetime reflects the fact that the majority of the measures are lighting replacements with a significant proportion of savings also coming from replacing conventional resistance water heaters.[231] Energy savings by networks and for the three aforementioned programs are shown below in Table 30.

Table 30: Energy Efficiency Savings in the NEM

Year	NSP Savings (GWh)	ESS Savings (GWh)	REES Savings (GWh)	VEET Savings (GWh)	Total EE Savings (GWh)	Energy Savings (% of total energy used)
2008	27.1	-	-	-	27	0.01%
2009	28.9	130	43	567	768	0.39%
2010	34.0	310	95	907	1,346	0.68%

Unfortunately, data on utility EE programs have not been collected prior to 2008 in Australia, and the three retail programs only have data from the past two years, making analysis from the desired 1990 baseline impossible.

The combined energy savings from the programs and initiatives described above can be compared to the savings achieved by the Mandatory Energy Performance Standards and energy rating labelling at approximately 6,600 GWh in 2010[232], or roughly six times the energy saved from initiatives within the NEM.

While no world average was found as a benchmark for performance, reporting on US energy savings programs is collated by the Energy Information Administration under the US

Department of Energy in their Electric Power Annual Report.[233] These data are shown below in Table 31.

Table 31: Energy Savings in the United States

Financial year	Energy Savings (GWh)	Total Load (GWh)	Energy Savings (% of total energy used)
2007	68,991	4,012,728	1.72%
2008	76,674	3,989,058	1.92%
2009	77,906	3,832,180	2.03%
2010	87,839	4,016,137	2.19%

The only comparable jurisdiction for which data on energy efficiency savings was readily available was the US. There do not appear to be any technical or structural barriers to limit Australian performance in terms of energy savings from energy efficiency programs to be in line with numbers from the US. Therefore, in the absence of more comprehensive date the US performance at approximately 2% of energy saved as a share of total energy produced seems a reasonable benchmark for Australian performance from energy efficiency programs. A comparison of the relative performance of the US and Australian systems is shown below in Table 32. Based on this target, a grading scale is shown in Table 33 below.

Table 32: Relative Comparison of US and Australian Energy Efficiency Performance

Financial year	Australian / US savings ratio
2008	0.7%
2009	19.1%
2010	31.1%

Table 33: Energy Efficiency grading scale (Method 1)

Grade	Explanation
A	Exceeds US EE performance by more than 50%
B	Meets or exceeds US EE performance by up to 50%
C	Within 50% of US EE performance
D	Less than 50% of US EE performance, but percentage of EE increased from previous year
F	Less than 50% of US EE performance and percentage decreased from previous year

As the percentage of energy efficiency in Australia was less than 50% of the performance in the US, but did increase from the previous year, the NEM receives a **D** for energy efficiency.

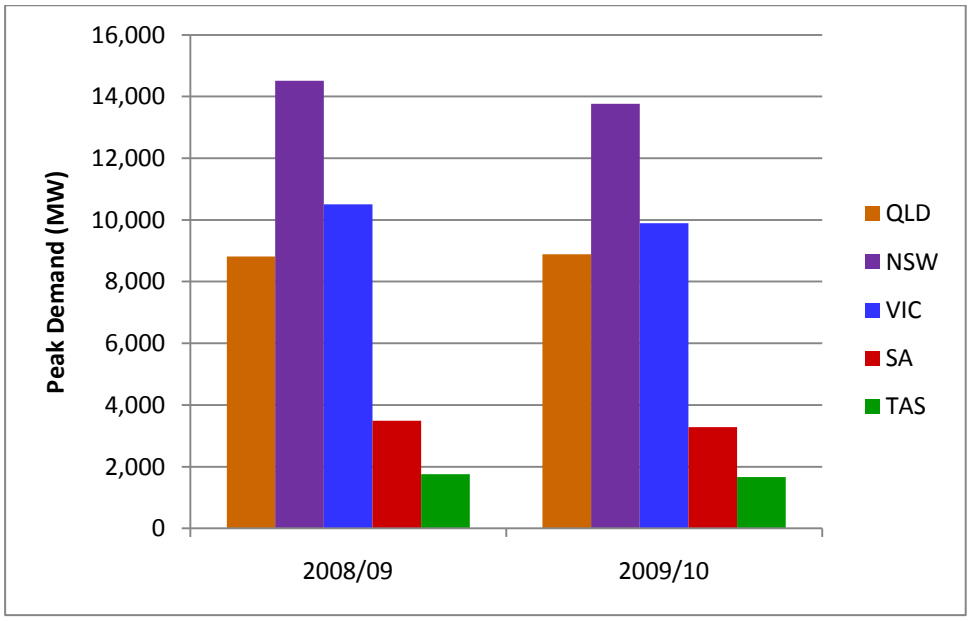
4.3.9. DEMAND MANAGEMENT - *GRADE D*

KPI: Proportion of peak demand met through demand management programs (% of total MW peak)

Demand management (DM) programs include efforts by Network Service Providers to reduce consumer electricity demand during peak times. DM was first introduced in Australia over 80 years ago with residential off peak water heating.[234] DM is generally understood to include load management, energy efficiency, distributed generation and time of use meters. Despite multiple successful DM programs, many barriers remain caused at least in part by the large number of stakeholders including customers, DNSPs, retailers and market operators.

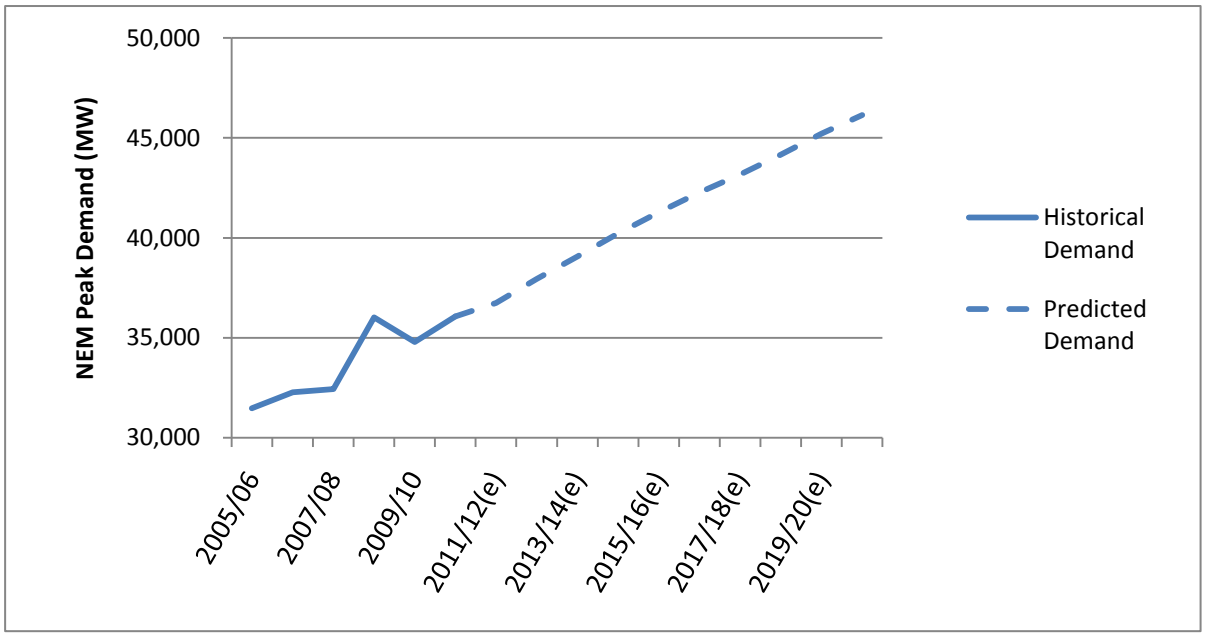
In the 2009-2010 financial year, the NEM peak electricity requirement reached 33,741 MW. This is a reduction from the previous summer peak of 34,843 MW.[235] Average annual growth since the 2004/05 year has been 3.5%.[236] Maximum demands by state in the 2008/9 and 2009/10 fiscal years are shown below in Figure 27.

Figure 27: Peak Demand by State



Coincident peak historical and 50% probability of occurrence medium growth scenario predicted demand for the NEM is shown below in Figure 28.[237] Coincident peak demand refers to the maximum demand that occurs in all NEM jurisdictions simultaneously and is less than the sum of peak demands for each state in the NEM. The 50% probability of occurrence medium growth scenario is the predicted NEM peak demand under a medium demand growth scenario where there is a 50% chance that the predicted peak demand will occur.

Figure 28: NEM Peak Demand

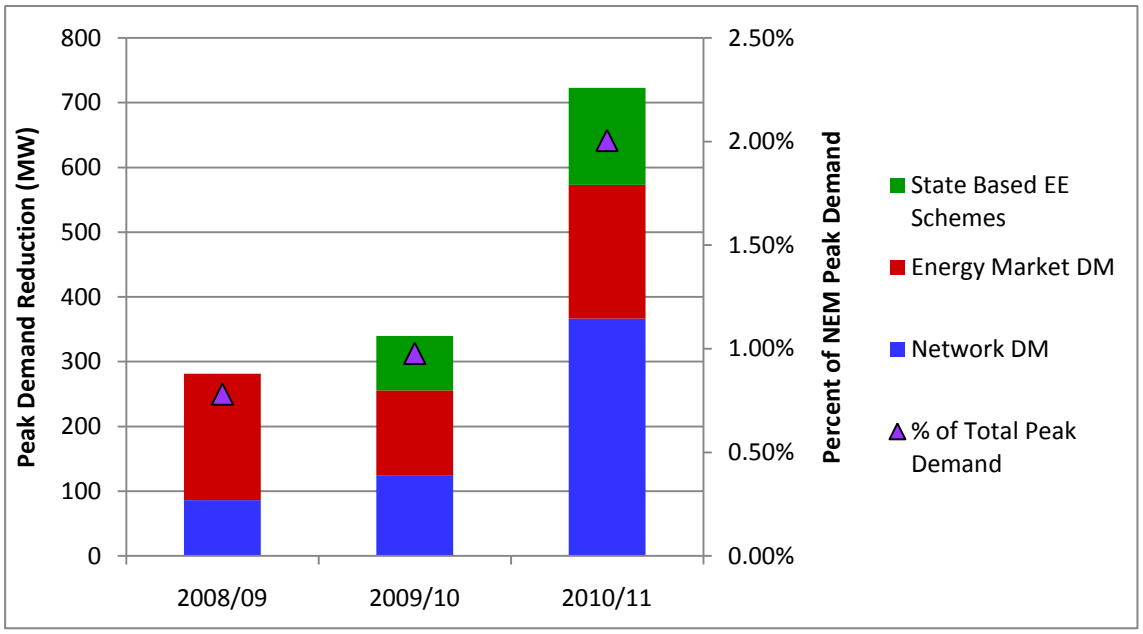


A recent report prepared for the Australian Alliance to Save Energy[238] analysed the results from a survey of electricity network service providers in Australia. In addition to programs delivered by NSPs, electricity market DM delivered by retailers also needs to be considered. The most recent AEMO Statement of Opportunities report[239] outlines these electricity market DM initiatives. These are added to state based programs primarily targeted at energy efficiency, but assumed to have a demand reduction impact calculated by assuming that the initiatives are spread evenly across each 24 hour period. These programs include EES, REES and VEET all discussed in more detail in section 4.3.8. All of these types of programs/measures are shown below in Figure 29. Combining network, energy market and state based DM, total DM in the NEM is also shown in Table 34 below.

Table 34: NEM Total Demand Management

Year	Peak Demand Reduction (MW)
2008/09	281
2009/10	340
2010/11 (forecast)	723

Figure 29: Peak Demand Reduction from Network and Energy Market DM



As with EE, there does not appear to be a world average benchmark for DM. Furthermore, there is no national target against which to benchmark or data as far back as 1990. While some comparison could be made against results from the WA market, the relatively small number of programs in WA makes it difficult to compare to the NEM. However, reporting on DM programs is done by the Energy Information Administration under the US Department of Energy in their Electric Power Annual report.[240]

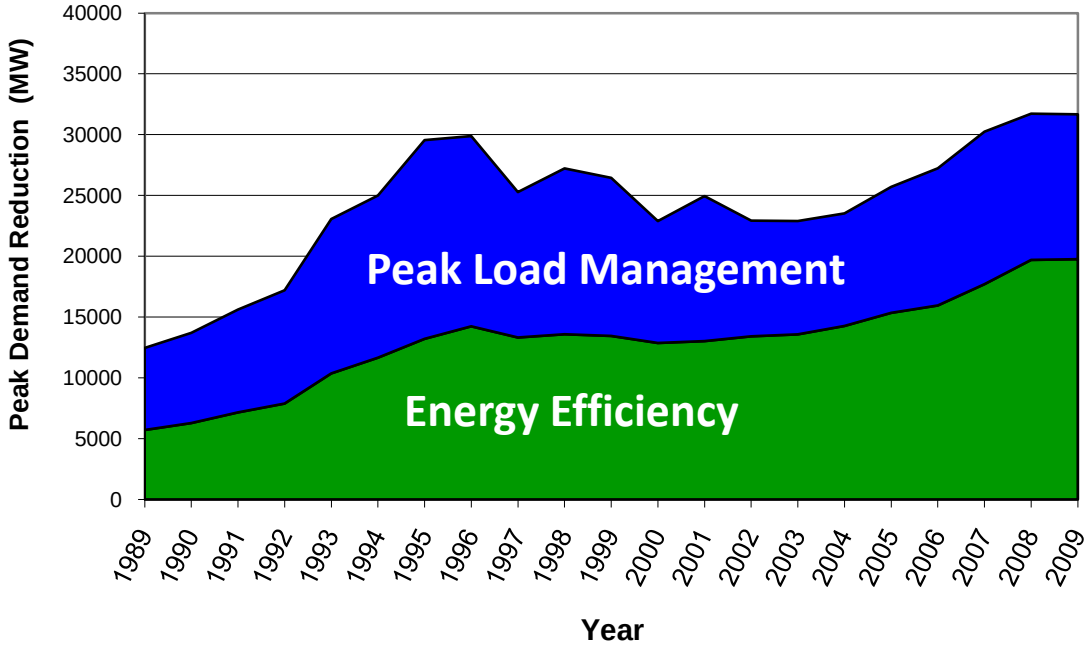
Table 35: US Demand Management

Year	Peak Load Reduction (MW)[241]	Total Peak Demand (MW)	DM (% of total peak demand)
2007	30,253	782,227	3.81%
2008	31,735	752,470	4.15%
2009	31,682	725,958	4.29%
2010	33,283	767,948	4.26%

Data for earlier periods is shown below in Figure 30 with a division between demand reductions because of peak load management programs versus energy efficiency programs.

Unfortunately, it appears that no data exists for Demand Management performance in Australia further back than 2008, precluding analysis from the desired 1990 baseline.

Figure 30: US Peak Demand Reduction



As with energy efficiency, there do not appear to be any technical or structural barriers to limit Australian performance in terms of electricity savings from DM programs as proportion of peak demand to be in line with numbers from the US where reductions of approximately 4.3% of total peak demand have been achieved. This target can also be justified due to the relatively low expenditure-to-savings ratios outlined in the recent A2SE report.[242]

A comparison of the relative performance of the US and Australian systems is shown below in Table 36.

Table 36: Relative Comparison of US and Australian Demand Management Performance

Year	Australian / US savings ratio
2008/09	18.8%
2009/10	22.8%
2010/11	47.0%

Based on this target, a grading scale is shown in Table 37 below.

Table 37: Demand Management grading scale

Grade	Explanation
A	Exceeds US DM performance by more than 50%
B	Meets or exceeds average US DM performance by up to 50%
C	Within 50% of US DM performance
D	Less than 50% of US DM performance, but DM % increased from previous year
F	Less than 50% of US DM performance and DM % decreased from previous year

As previously mentioned, the metric chosen for grading was used as insufficient data was available to benchmark against historical performance and no national targets exist against which to benchmark. As the percentage of DM in Australia was less than 50% of the performance in the US and increased from the previous year, the NEM receives a **D** for demand management.

4.3.10. PROTECTION OF VULNERABLE CUSTOMERS – *GRADE C*

4.3.10.1. DISCONNECTIONS – *GRADE C*

KPI: Number of disconnections of residential customers on payment plans or pensions

Disconnection of an essential service, such as electricity, is expensive for both the consumer and the provider and creates further hardship for consumers who are already experiencing financial difficulties.[243] The level of disconnections of residential customers on payment plans or pension provides a strong indicator of the NEM's performance in meeting the long-term interests of customers. Survey respondents ranked the disconnection of residential customers on payment plans or pensions as the fifth most important KPI. The percentage of residential electricity customer disconnections of customers on payment plans and/or those on pensions or concessional discounts is shown in Table 40 below. Data covering this KPI was available for NSW, Vic and SA only, so data for these jurisdictions has been combined and presented in aggregate and used for NEM grading purposes.

A proposed national grading system is presented for the NEM in Table 41. This grading scale is based on the New South Wales, Victorian and South Australian combined weighted percentage of disconnections of customers that were pensioners and/or on payment plans prior to disconnection. Disconnections of residential customers previously receiving pensioner or concessional discounts are shown in
Table 38 and Table 39 with a graphical depiction of the vulnerable customers in New South Wales, Victorian and South Australia shown in Figure 31.

Data covering disconnections of residential customers on payment plans and/or pensions is not available for all states and territories, or for all years. However, from July 1 2012, this data is to be reported for the NEM on a national scale by the AER. Data for Queensland was sourced from retailer rather than distributor data, as distributers do not report disconnections of pensioner/concession cardholders. While distributor data is generally regarded as more accurate than retailer data, for consistency, data from Queensland electricity retailers was used for all calculations undertaken for Queensland in the "Disconnections" KPI.

Furthermore, in Queensland, the number of small residential customers participating in a hardship program is reported on a quarterly basis only and no annual figures are made available. To avoid double counting when calculating an annual figure, the estimated number of customers participating in a hardship program annually has been calculated by averaging the quarterly figures for customers in hardship programs during 2010/11. It is likely that this approach underestimates the actual number of customers on hardship plans in Queensland in 2010/11.

Table 38: Disconnections of residential customers previously on payment plans

NEM Region	Year				
NSW[1]	**2006/07**	**2007/08**	**2008/09**	**2009/10**	**2010/11**
Residential small retail customers on payment plans prior to disconnection as a % of all residential small retail disconnections	–	25.0	29.5	29.2	–
No. of residential small retail customers on payment plans prior to disconnection	–	4,537	5,363	4,554	–
No. of residential small retail customers using payment plans	–	93,072	94,145	116,983	–
No. of residential small retail disconnections	18,339	18,153	18,168	15,595	–
No. of residential customers	2,786,091	2,840,021	2,862,401	2,919,758	–
Vic[2]					
Residential disconnections previously on a budget instalment plan as a percentage of residential electricity disconnections	27.0	29.0	32.0	34.0	–
No. of domestic customers on budget instalment plans	97,052	86,158	84,616	92,493	–
No. of residential disconnections	6,968	6,249	9,568	13,486	–
No. of residential customers	2,141,284	2,164,899	2,190,588	2,248,207	–
Qld[3]					
Estimated no. of small residential customers participating in hardship program #	–	–	–	–	6,102
No. of small residential customer disconnections due to non-payment	–	–	14,853	17,913	24,598
No. of small residential disconnections	–	–	–	–	128,004
No. of residential customers	1,629,232	1,670,789	1,697,545	1,742,545	–
SA[4]					
Residential customer disconnections for non-payment previously on instalment plans as a % of disconnections	5.2	7.0	17.8	40.0	–
Residential customer disconnections for non-payment previously on instalment plans	271	411	1098	1927	–
No. of residential customers on instalment plans	15,477	21,592	19,667	22,282	–
No. of residential customer disconnections	5,190	5,839	6,118	4,748	–
No. of residential customers	688,524	697,518	708,242	717,813	–
Data unavailable for ACT and Tas					

Sources: [1]IPART; [2] ESC; [3] QCA; [4]ESCOSA and ESAA.

Calculated by averaging the quarterly report of customer numbers in hardship programs during 2010/11.

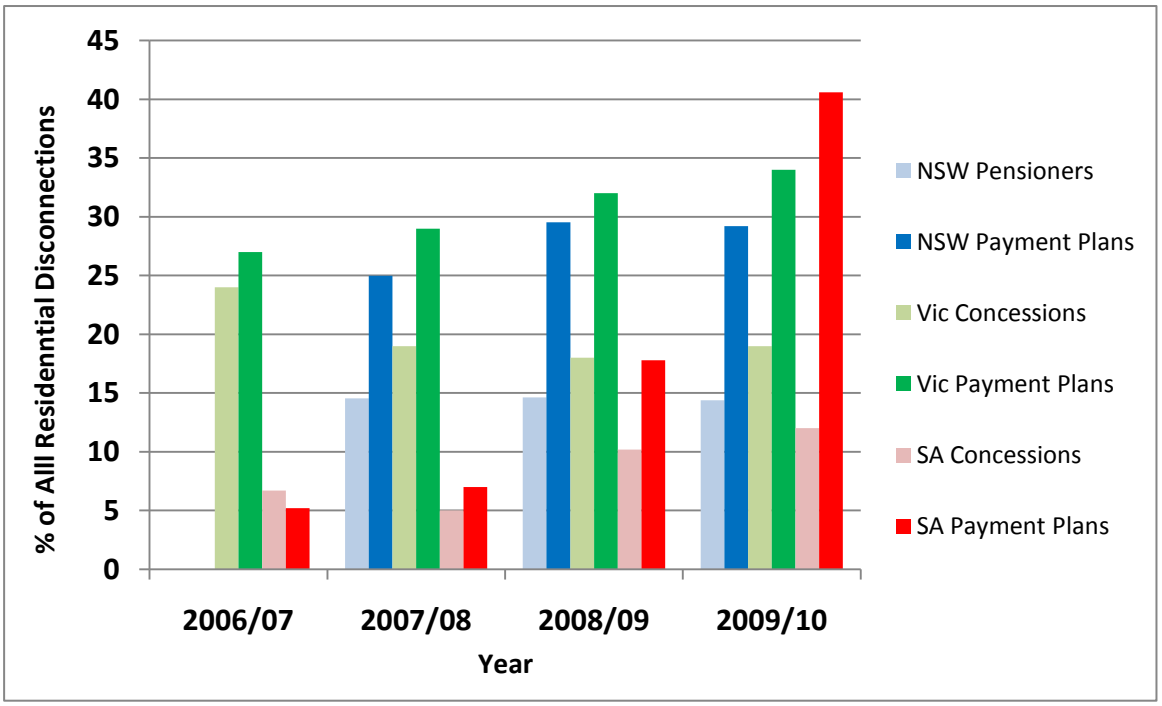
Table 39: Disconnections of vulnerable residential customers

NEM Region	Year				
NSW[1]	**2006/07**	**2007/08**	**2008/09**	**2009/10**	**2010/11**
Residential small retail customers receiving pensioner energy rebate prior to disconnection as a % of all residential small retail disconnections	–	14.6	14.6	14.4	–
No. of residential small retail customers receiving pensioner energy rebate prior to disconnection	–	2,642	2,659	2,245	–
No. of residential small retail disconnections	18,339	18,153	18,168	15,595	–
No. of residential customers	2,786,091	2,840,021	2,862,401	2,919,758	–
Vic[2]					
Residential concession cardholder disconnections as a percentage of total residential electricity disconnections	24.0	19.0	18.0	19.0	–
No. of residential disconnections	6,968	6,249	9,568	13,486	–
No. of residential customers	2,141,284	2,164,899	2,190,588	2,248,207	–
Qld[3]					
Residential small customer pensioner/concession cardholder disconnections due to **non-payment** as a % of all residential small customer disconnections due to **non-payment**. #	–	–	–	–	17.8
Residential small customer pensioner/concession card holder disconnections due to **non-payment**	–	–	–	–	4,371
No. of small residential customer disconnections due to non-payment	–	–	14,853	17,913	24,598
No. of small residential disconnections	–	–	–	–	128,004
No. of residential customers	1,629,232	1,670,789	1,697,545	1,742,545	–
SA[4]					
Residential customer disconnections for non-payment who are concession recipients as a % of total disconnections	6.7	5.0	10.2	12.0	–
Residential customer disconnections for non-payment who are concession recipients	350	294	632	568	–
No. of residential customer disconnections	5,190	5,839	6,118	4,748	–
No. of residential customers	688,524	697,518	708,242	717,813	–
Data not available for ACT and Tas					

Sources: [1]IPART; [2] ESC; [3]QCA; [4]ESCOSA and ESAA

Only data covering pensioner/concession cardholder disconnections due to *non-payment* is available. To present an appropriate figure for comparison, residential small customer pensioner/concession cardholder disconnections are presented as a percentage of *all* residential customer disconnections due to *non-payment* only.

Figure 31: NSW[1], Vic[2] and SA[3] Vulnerable Customer Disconnections



Sources: [1]IPART; [2] ESC; [3]ESCOSA

Unfortunately, suitable international benchmarking data for NEM was not found. For instance, residential electricity disconnections are reported in the UK,[244] however data covering customers on payment plans or pensions prior to disconnection is not made public. National historical data against which to benchmark the NEM is also lacking.

Table 40: NSW, Vic and SA combined pensioner and payment plan disconnection data

NSW[1], Vic[2] and SA[3] Combined Disconnection Data	Year		
% of pensioners and customers on payment plans among residential electricity disconnections	**2007/08**	**2008/09**	**2009/10**
	20%	22%	24%

Sources: [1]IPART; [2] ESC; [3]ESCOSA

Table 41: NEM customer disconnection grading scale

Grade	% of pensioners and customers on payment plans among residential electricity disconnections
A	< 5 %
B	Between 5–15%
C	Between 15–25 %
D	Between 25–35%
F	> 35%

Based on the grading scale presented in Table 41, the NEM (NSW, Vic and SA) receives a **C** for the proportion of disconnections made up of customers on pensions and/or payment plans in 2010.

4.3.10.2. 'ENERGY POVERTY' – *UNGRADED*

KPI: Number of households that are 'energy poor' i.e. electricity costs are greater than 10% of household budget

Energy poverty has been a significant focus for governments, the energy sector and social welfare organisations particularly across Europe. In Australia, there has been extensive discussion of energy affordability, access and hardship, however there has been a reluctance to take on the terminology of fuel poverty. For example, some stakeholder survey respondents commented that the term was simplistic and the 10% figure arbitrary. The number of households that are energy poor was ranked as the eighth highest KPI by all survey respondents, but equal 19th by residential consumer advocates (see Table 54).. With this in mind a discussion of energy poverty in Australia is given in this Report in addition to the KPI of the number of disconnections of residential customers on payment plans or pensions.

In the UK, the standard definition of energy or fuel poverty is a household that needs to "spend more than 10% of its income on fuel for adequate heating (usually 21 degrees for the main living area, and 18 degrees for other occupied rooms)".[245] However, it should be noted that a review of this definition is currently underway. In a recent paper for AGL on energy poverty in Australia, Simshauser et al.[246] defined energy poverty in the Australian context as "a household that actually spends more than 10% of its income on energy". It should be noted that their report simplified its analysis by focusing on all-electric housing stock, thus eliminating the need to model the role of gas.

Using this Australian definition and associated modelling, Simshauser et al[247] estimate that 33% of low income households[248] or 6.6% of all NSW and QLD households[249] will experience fuel poverty by 2015–16. Their modelling suggests that in 2008–09 those in the lowest disposable household income quintile spent an average of just below 7% of their income in electricity. Only those households in the lowest quintile who consumed 12,000kWh of electricity per year or more were likely to experience fuel poverty in 2008–09. It is estimated that 12% of households in the lowest quintile consume more than 12,000kWh per year. This suggests that over the current period to 2015–16 the incidence of fuel poverty is likely to rise significantly from 12% of low income households in 2008–09 to 33% in 2015–16.

Despite the fact that some modelling of fuel poverty numbers has been done for NSW and QLD[250] the data is not sufficient to provide an overall grade for the NEM. While there is likely to be a rise in energy poverty in the NEM and this is of concern and should be addressed, the NEM scores an **Ungraded (UG**) for Energy Poverty.

This is another area where the collection and reporting of more reliable and consistent data across the NEM would be desirable.

4.3.11. CUSTOMER SATISFACTION – *GRADE C*

4.3.11.1. COMPLAINTS – *GRADE C*

KPI: Number of complaints per year

Customer complaints provide a measure of the NEM's performance in terms of end use customer expectations. Historical NEM electricity customer complaints directed to electricity retailers, as a percentage of total customers and a NEM-wide weighted average, are presented in Table 42 below. The volume of customer complaints directed to electricity retailers provides a general measure of the quality of service and how well the expectations of end use customers are being met. Data covering complaints lodged with jurisdictional regulators and/or ombudsman have not been included.

Table 42: Retail customer complaints as a percentage of total customers[251]

Retail customer complaints as a percentage of total customers				
State	**Year**			
	2005/06	**2006/07**	**2007/08**	**2008/09**
QLD	–	–	1.0	1.6
NSW	0.6	0.5	0.4	0.4
Vic	0.7	0.8	1.0	2.3
SA	0.8	0.8	0.8	1.2
Tas	0.5	0.4	0.5	0.5
ACT	0.4	0.5	1.0	0.9
Weighted NEM Average (%)	0.51	0.50	0.53	0.92

Research was undertaken to locate international data on the volume of residential electricity customer complaints and trends for the purpose of benchmarking NEM performance. Unfortunately, differences in the ways complaints are classified and recorded made an international comparison difficult. In light of this a proposed national grading scale for the NEM based on historical performance is presented in Table 43 below. The grading scale was developed by assigning an "A" for NEM weighted average percentages of customer complaints that are lower than the lowest customer complaints percentage achieved in any NEM region in the last five years. Similarly an "F" was assigned for NEM weighted customer complaints percentages above the highest percentage recorded in any NEM region. The intermediate grades are distributed evenly between these minimum and maximum historical values.

Table 43: Weighted NEM average % of customer complaints

Grade	Weighted NEM Average % of customer complaints in 2009
A	< 0.3 %
B	0.3–0.8 %
C	0.8–1.3 %
D	1.8–2.3 %
F	> 2.3 %

Based on the above grading scale the NEM receives a **C** for customer complaints in 2009.

4.3.11.2. SURVEYED CUSTOMER SATISFACTION – UNGRADED

KPI: Surveyed Customer Satisfaction

While surveying customers is one of the best ways of determining whether the NEM is working in their long term interests, currently, none of the organisations responsible for the functioning of the NEM undertake regular customer satisfaction surveys. Internationally a number of electricity regulators survey customers on a regular basis. Examples include OFGEM in the UK and the Californian Public Utility Commission.[252] In Australia, while AEMO is considering surveying consumers regarding the national Value of Customer Reliability (VCR), currently no data is available on surveyed customer satisfaction. As such, the NEM receives an **Ungraded** for surveyed customer satisfaction.

4.3.12. LEVEL OF COMPETITION – *GRADE B*

KPI: Extent of market concentration

Survey respondents ranked the extent of market concentration KPI as equal third in importance. This is probably a reflection of the public's understanding that customers generally receive a better deal when purchasing products and services from businesses that operate in competitive markets. In line with this understanding the NEM retail sector has progressively been moved towards greater competition, with Tasmania the only remaining NEM jurisdiction without "full retail contestability".[253]

The NEM involves dynamic trading between electricity generators, wholesalers and retailers based on variable pricing levels that are influenced by demand.[254] Market concentration, also known as industry concentration or market power, provides a measure of company market share and thus an indication of the level of competition in the market. Traditional measures for market concentration include the Herfindahl-Hirschman Index (HHI) and concentration ratio (CR(n)).[255]

However, the NEM (and other competitive electricity systems) are unlike other markets, as demand and supply for the product (electricity) must be matched continuously and instantaneously, as electricity supply cannot be economically stored. This and other characteristics of the NEM mean traditional measures of market concentration vary with situation and time, and in response to factors such as interconnection or inter-regional trade.[256] In particular, the reliability of these measures as indicators of market concentration in electricity generation markets is disputed.[257]

London Economics & Global Energy Decisions[258] suggest the traditional tools of competition analysis should be used in concert with measures designed specifically for electricity market analysis, such as the Residual Supply Index (RSI) and the Pivotal Supplier Index (PSI). These measures focus on company market share, identifying the indispensability (or 'pivotalness') of companies to meeting demand. The more indispensable/pivotal a company is, the more market power that company is considered to have.[259] However, they reported that even with detailed analysis, uncontrolled factors in their analysis may have caused the appearance of market power, and that the existence of market power is not necessarily evidence of its abuse[260].

The AEMC is currently investigating potential electricity generator market power in the NEM.[261] Prompted by a submission from Major Energy Users Inc., the results of this work is expected to be released later in 2012.

With the above constraints in mind annual HHI market concentration values for NEM generation market share by capacity are presented in Table 44. HHI data for years prior to 2006 was not available at the time of writing this report.

Table 44: Market Concentration for NEM generation sector by capacity[262]

Annual HHI (Market Concentration) Values for NEM Generation by Capacity					
HHI (Market Concentration)	**Year**				
	2006	**2007**	**2008**	**2009**	**2010**
	751	720	775	774	728

Average HHI market concentration values for electricity generation for selected European countries is presented below in Table 45 below.

Table 45: Electricity generation market concentration (selected countries 2003 & 2005)[263]

Country	HHI (Electricity generation markets Market Concentration)
BE Belgium	8,307
DE Germany	1,914
ES Spain	2,790
FR France	8,592
NL Netherlands	2,332
GB Great Britain	1,068

A potential grading scale for market concentration in the NEM generation sector is presented in Table 46 below. The grades in Table 46 are based on the U.S. Department of Justice and the Federal Trade Commission – Horizontal Merger Guidelines that state the following bounds for HHI market concentration measures:

Table 46: US Dept. of Justice, market concentration bounds for horizontal mergers[264]

Unconcentrated Markets:	HHI below 1500
Moderately Concentrated Markets:	HHI between 1500 and 2500
Highly Concentrated Markets:	HHI above 2500

Also considered is the ACCC's use of HHI when assessing the potential impact of mergers on a market. The ACCC will generally be less likely to identify horizontal competition concerns when the post-merger HHI is less than 2000, or greater than 2000 with a post-merger change in HHI of less than 100.[265]

The overarching theme of the proposed grading scales is increased competition in electricity generation which should lead to a better deal for the electricity consumer and support their long term interests.

Table 47: NEM HHI market concentration generation grading scale

Grade	Explanation
A	HHI < 1500
B	HHI > 1500 and < 1835
C	HHI > 1835 and < 2170
D	HHI > 2170 and < 2500
F	HHI > 2500

On the basis of the grading scale in Table 47 the NEM generation market receives an **A**.

Retail electricity market

Within the NEM, individual markets govern supply in both wholesale and retail sectors with a purported open access regime in place for the transmission and distribution networks. These networks are subject to price regulation in recognition of the potential for market power abuse.[266] The energy supply industry sectors display ownership links, as significant vertical integration exists between energy retail markets and upstream energy production.[267]

Within the NEM, all jurisdictions, except Tasmania, now have full retail contestability (FRC) allowing all customers to enter into a contract with their retailer of choice.[268]

The AEMC assesses the effectiveness of retail competition in each NEM jurisdiction[269] but these reviews are often undertaken at different times (e.g. 2008 VIC and SA, 2010 ACT) and as such, may be difficult to incorporate in an annual benchmark indicator.

Table 48: Market concentration of state electricity retail markets in NEM

	Based on Small Residential Electricity Customer Numbers (Herfindahl-Hirschman Index - HHI)					
State	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Vic[1,4,6]	2963	2730	2566	2518	2504	2514
SA[1,2,5]	6380	5054	3862	3411	3505	3618
Tas[1*]	10000	10000	10000	10000	10000	10000
Qld[2]	-	-	3554	2890	-	-
NSW[3]	-	-	-	-	-	2405
ACT	-	-	-	-	-	8925^
Weighted Average	-	-	-	-	-	3009[#]

[1]AER, 2010 p.96 taken from graph; [2]AER, 2009 p.195 taken from graph; [3]IPART, 2011 p.5; [4]AER, 2007 p.173; [5]ESCOSA , 2010 p. 26; [6]ESC, 2010 p.3; ^AEMC, 2010 p.25 Quarter 4 2009 value; [#]Qld omitted from NEM average HHI as data not available.

*Legislation prevents entry of new suppliers in the small residential market[270]
More frequently reported data that has been used to indicate competition in the retail electricity market is "churn" or the transfer from one electricity retailer to another.[271, 272] However, this indicator is also an imperfect measure of market competition.[273,274]

With the above constraints in mind, a depiction of market concentration in the retail NEM is presented in Table 48 above, calculated using retailer market share by customer number data published annually in the AER's State of the Energy Market report.

For the purposes of benchmarking NEM retail HHI market concentration, data for EU countries based on customer number in 2010 is presented in Table 49 and data for Great Britain alone is presented in Table 50.

Table 49: Market concentration in residential retail electricity market in the EU[275]

Country	Based on 2010 retail customer numbers (Herfindahl-Hirschman Index HHI)
Germany	300
Finland	600
Austria	700
Sweden	700
United Kingdom	1400
Poland	1500
Netherlands	1850
Denmark	2300
Slovenia	2300
Slovakia	2700
Romania	2900
Hungary	3000
Spain	3000
Czech Republic	3400
Bulgaria	3400
Belgium	4000
Lithuania	4400
Ireland	4600
Luxembourg	4800
Italy	7200
France	8400
Portugal	8700
Estonia	8800
Latvia	9700
Cyprus	10000
Greece	10000
Malta	10000

Table 50: HHI market concentration for Great Britain

National Domestic Electricity Market	
Year	**HHI Market Concentration**
2008	1735
2009	1751

Ofgem & NIAUR 2009 p.29; Ofgem & NIAUR 2010 p.30

Table 51: NEM HHI market share international grading scale

Grade	Explanation (HHI electricity retails market concentration rank for EU countries - lowest to highest)
A	Within top 5 EU Countries with respect to market concentration
B	Within top 10 EU Countries with respect to market concentration
C	Within top 15 EU Countries with respect to market concentration
D	Within top 20 EU Countries with respect to market concentration
F	Within top 25 EU Countries with respect to market concentration

A weighted average for the NEM HHI in 2010, bar Queensland, was calculated as 3009. Based on the grading scale presented in Table 51 the NEM scores a **C** for retail market concentration.

Network market power

Normally discussions of market concentration relate to the level of market power within a competitive market. However, it is worth noting that the greatest level of potential market power is not in the generation or retail sectors but in the network sector. It is generally not appropriate to talk about market concentration in this part of electricity sector as the networks are natural and regulated monopolies so there is effectively no market. For this reason discussion of market concentration is not considered here in relation to electricity networks.

Given the natural monopoly character of electricity networks, this market power need not be a barrier to the efficient operation of electricity markets, provided networks are competitively neutral between network infrastructure on one hand and distributed generation, demand management and energy efficiency on the other. The evidence presented in this report, as in numerous reports on this topic, would suggest in practice this competitive neutrality is often absent. The reasons for this are complex but relate to a number of factors including the form of regulation, the nature of policy settings and organisational culture. (For further discussion of these institutional barriers please see the CSIRO Intelligent Grid, *Institutional Barriers to Intelligent Grid*, *Working Paper 4.1*.[276]) The range of policy and regulatory measures that can be and have been applied to address

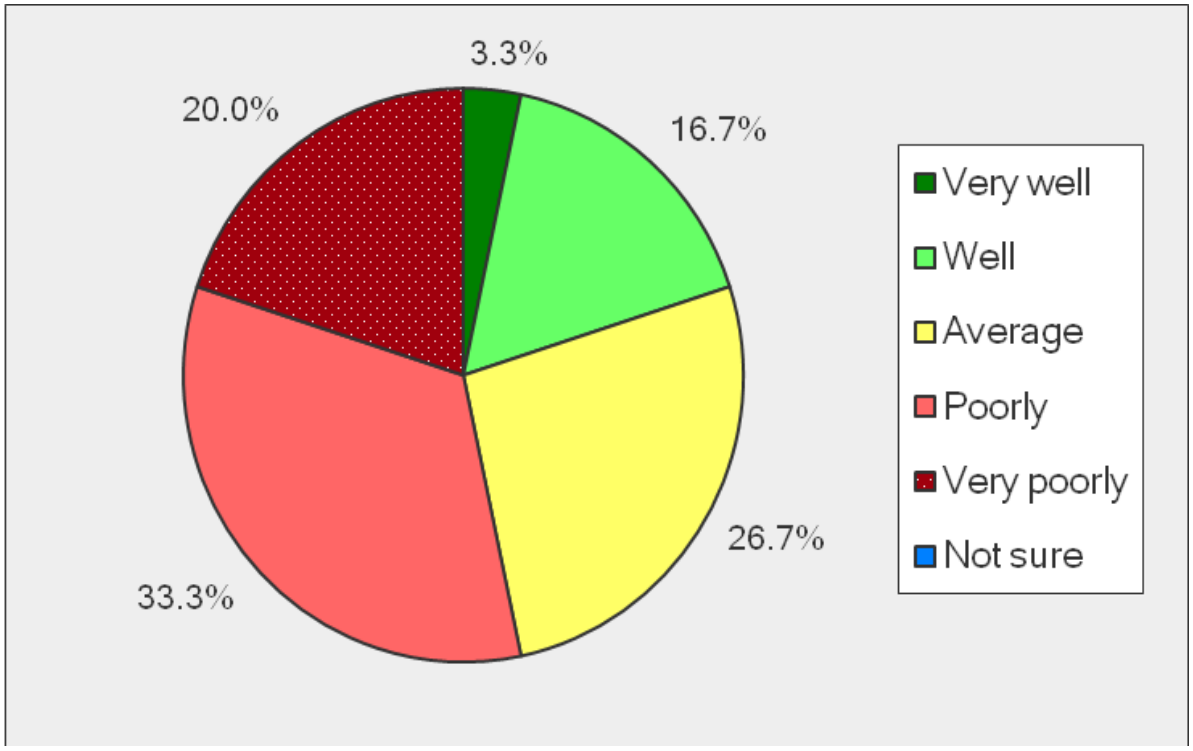
these barriers include changing economic regulatory incentives and separation of the role of network planning from network operation. For further information, please refer to sections 3 and 4 of the CSIRO Intelligent Grid, *20 Policy Tools for Developing Distributed Energy, Working Paper 4.2*[277]

To provide a grade for overall NEM market concentration, a simple average of the scores for generation sector (A) and retail sector (C) market concentration was taken, while no account was taken for the impact of network monopoly. This means that the NEM scores a **B** for market concentration.

4.4.SURVEY RESPONDENTS' VIEWS ON NEM PERFORMANCE

As part of the stakeholder consultation survey, respondents were asked to rate how the NEM is performing with respect to the NEO. This enables a comparison to be made between the results of the Report Card and how different stakeholders perceive the performance of the NEM.

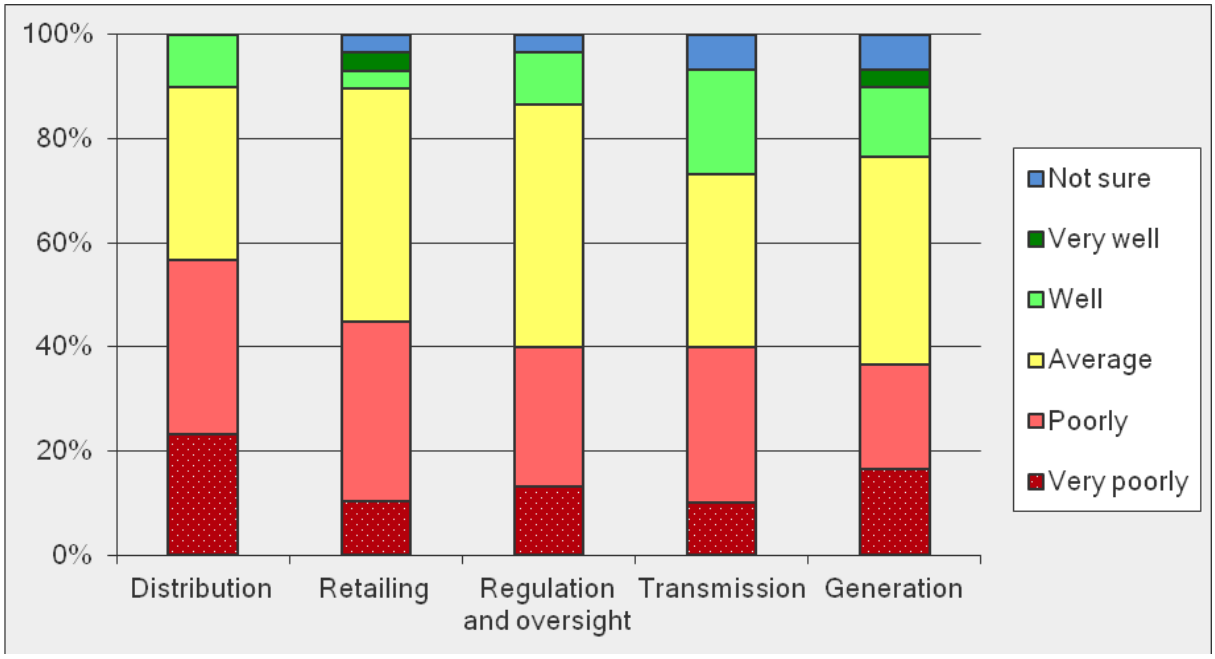
Figure 32: How well is the NEM meeting its Objective



Survey Question: "To what extent do you believe the overall National Electricity Market is currently promoting the efficient investment in and operation and use of, electricity services for the long term interests of electricity consumers?"

Figure 32 indicates that only 20% of survey respondents think the NEM is currently fulfilling the NEO well or very well, while 53% of respondents believe the NEO is being poorly or very poorly fulfilled. When the NEM is broken into component parts (Figure 33), respondents think the distribution sector is the sector that is performing worst with respect to the long term interest of consumers. Additionally, less than 10% of respondents believe that the electricity retail sector and regulation and oversight organisations are operating very well or well with respect to the long term interests of consumers.

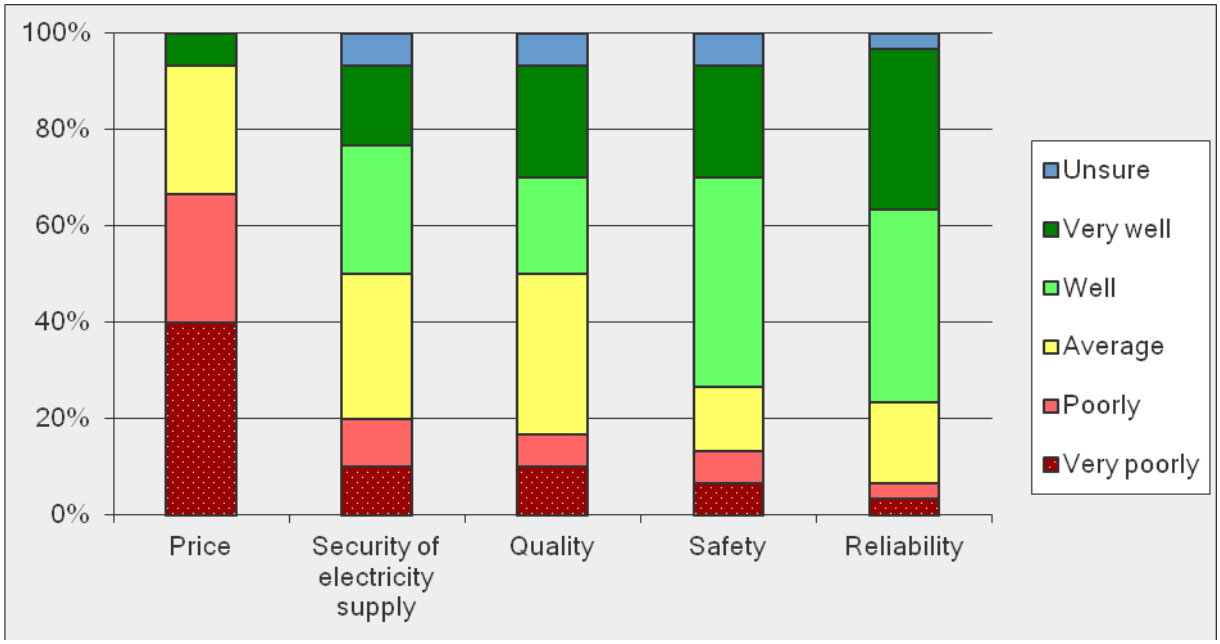
Figure 33: How well are elements of the NEM serving consumers' interests?



Survey Question – "To what extent do you think these elements of the NEM are currently operating in the long term interests of electricity consumers?"

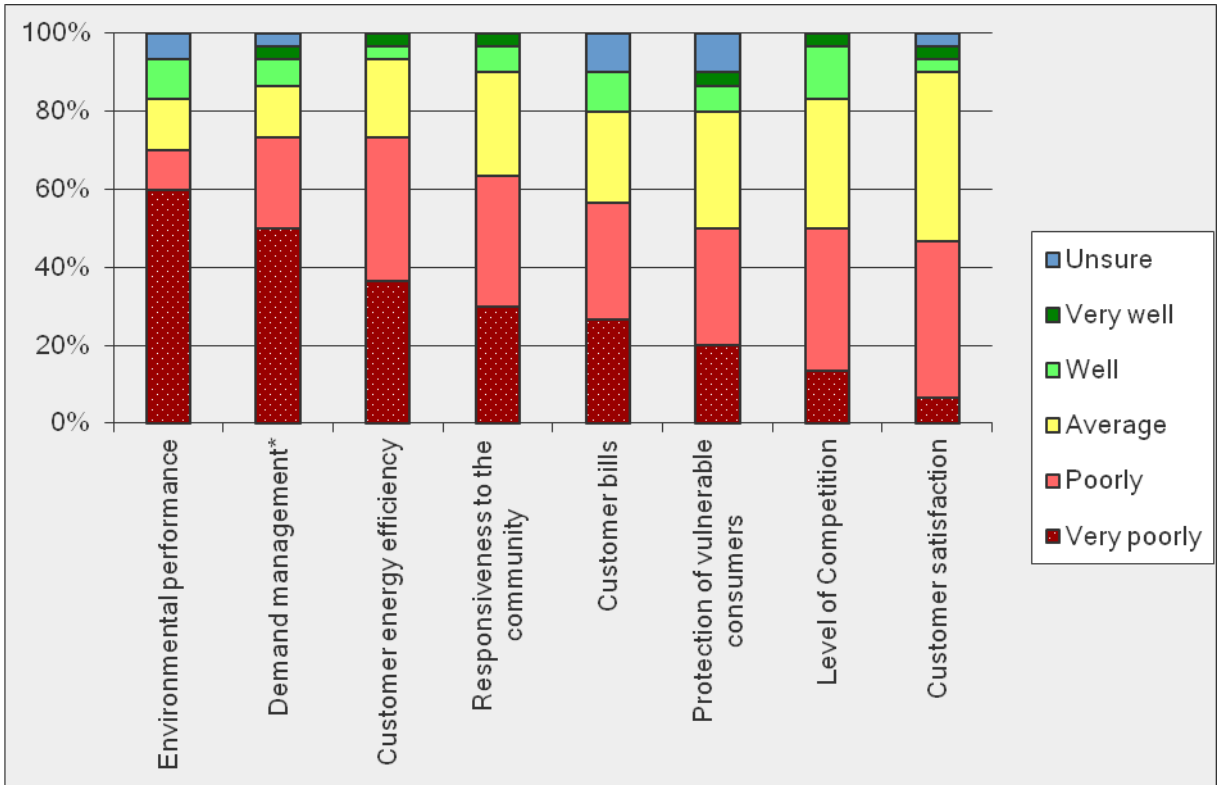
Survey participants were also asked to rate the operation of the NEM in relation to both the existing criteria for the long term interest of consumers (Figure 34) and potential additional criteria for the long term interest of consumers (Figure 35).

Figure 34: How well is the NEM meeting the existing criteria of the NEO?



Survey Question – "How well do you believe the National Electricity Market is performing with respect to the existing criteria for the long term interest of consumers?"

Figure 35: How well is the NEM meeting other possible criteria for the NEO?



Survey Question – "How well do you believe the National Electricity Market is performing with respect to other criteria for the long term interest of consumers?"

To compare the survey responses with the grades given in this report card, an average was taken of the responses from Figure 34 and Figure 35 and then converted into a grade, the results of which are shown in Table 52, shows that for the existing NEO criteria for long term interest of consumers, stakeholders consider the NEM to be operating better on reliability and worse on price than the Report Card results, while for the additional criteria the Report Card gives Customer Bills and Protection of Vulnerable Consumers a higher grade, but Environmental Performance, Demand Management and Customer Satisfaction a lower grade than stakeholders on average. The largest discrepancy between the Report Card and Stakeholder Survey grading results is with Customer Bills, which is discussed in more detail in Section 4.5.3.

Table 52: NEM Performance Ranking – Report Card versus Stakeholder Survey

Current NEO Criteria	Grade (Report Card)	Grade (Stakeholder Survey)
Reliability	B	B
Security of Supply	C	C
Quality	Ungraded	C
Safety	Ungraded	B
Price	C	D
Possible New Criteria		
Customer bills	B	D
Environmental performance	F	D
Energy efficiency	D	D
Demand management	D	D
Protection of vulnerable consumers	C	D
Customer satisfaction	C	C
Level of Competition	B	C

4.5.DISCUSSION

4.5.1. DATA ADEQUACY

Perhaps the most significant finding from the process of developing a NEM Report Card has been the lack of adequate publicly accessible data. One might expect that for the criteria which are currently included in the NEO – price, reliability, quality safety and security of supply that there would be good consistent data available.

Instead, what has been observed is that even for fundamentally important criteria the data is often poor, inconsistent or incomplete, particularly relating to the consumer side of the market. For example, while there is half-hour reporting on the wholesale electricity price for power stations, the residential retail electricity price KPI has a gap in transparent reporting across the NEM from when the Electricity Supply Association of Australia (ESAA) stopped publishing pricing information in 2004 until 2011 when AEMC undertook their recent pricing report. This is particularly the case in Victoria, where no state body has reported on trends in electricity pricing since full retail market deregulation was introduced.

There is even less data for those criteria (e.g. demand management, energy efficiency, customer satisfaction, protection of vulnerable consumers etc.) that are on the demand side and not currently incorporated into the NEO. Conversely, one of the most comprehensive data sets found was for environmental indicators, despite a lack of

inclusion in the NEO. In particular, there is good data available on renewable energy generation and greenhouse gas emissions in the NEM, which are both primarily functions of supply side activity and emissions reporting is required as part of Australia's international climate commitments. Indeed, this imbalance in available data reflects a focus of the NEM on the supply side at the expense of the demand side that has widely recognized, including by the MCE.[278]

In the case of other criteria currently included in the NEO the availability of the data is mixed. For the safety KPIs, with the exception of the ESAA, there is no consistent reporting across states in the NEM, while for security of supply, there is no clear indicator of how well the NEM is operating. The issues of what are security of supply and reliability is discussed in more detail below.

For the additional criteria to address long term interests of consumers as proposed by this report the quality of the data available is also very variable. There was either a complete lack of data or inconsistent data across states for the protection of vulnerable consumers. When it comes to customer satisfaction, no survey data is available at a NEM level and there is no public customer satisfaction data other than data on complaints. For the level of competition there does not seem to be a KPI or data available that adequately addresses the complexity of the electricity market.

In summary, the key data inadequacies identified through this report are:

- lack of appropriate KPIs
- lack of current data
- lack of consistent data/reporting across the NEM states
- lack of time series data
- lack of or differently reported international data to compare and benchmark against.

There is a clear need and capacity within the substantial resources of the NEM and its institution to address these data inadequacies. The severe deficiency in data raises the question: How can stakeholders be confident whether the NEM is fulfilling its objective and operating in the long term interests of consumers if basic data is not collected or has not been measured consistently across the NEM or over time? And as the maxim often attributed to Lord Kelvin states: If you cannot measure it, you cannot improve it.

4.5.2. MEASURING RELIABILITY AND SECURITY OF SUPPLY IN THE NEM

Our survey respondents identified two KPIs related to the security and reliability of electricity supply in the NEM as being of high importance to the long-term interests of electricity consumers. There were:

- Reliability - System Average Interruption Duration Index (SAIDI)
- Security of supply - System-wide demand exceeding generation capacity - MWh of unmet load

The Australian Energy Market Operator (AEMO) defines security and reliability of supply as follows:

Security of supply is a measure of the power system's capacity to continue operating within defined technical limits even in the event of the disconnection of a major power system element such as an interconnector or large generator[279].

Reliability is a measure of the power system's capacity to continue to supply sufficient power to satisfy customer demand, allowing for the loss of generation capacity[280].

For the purposes of reporting the above definitions of reliability and security are further defined below.

Under the National Electricity Rules (NER) the AEMO is responsible for maintaining the security of the NEM (NER, Version 45, clause 4.3.1 p.295) and the AEMC Reliability Panel is responsible for maintaining the reliability of the NEM.

The AEMC Reliability Panel measures NEM reliability performance using the Unserved Energy (USE) indicator. The Reliability Standard, 0.002% USE, is the maximum expected amount of energy at risk of not being delivered to customers due to a lack of available capacity.[281] Supply interruptions in transmission and distribution networks that do not impact on inter-regional transfer capability are not included in USE.[282] As such, the Reliability Standard applies to supply interruptions classified as reliability events[283] that originate in the generation sector and the inter-regional elements of the transmission sector.[284]

The Reliability Standard only considers USE due to lack of generation or inter-regional transmission during normal operation of the network within its designed security level, i.e. during a single contingency (credible) event, but not during a multiple contingency (non-credible) events. Any USE experienced due to a multiple contingency event or due to the management of multiple contingency events is classed as a security[285] event.[286]

The distinction between reliability and security events outlined above can be confusing. Similar, and perhaps easier to follow, definitions are provided by the North American Electric Reliability Corporation (NERC). 'Adequacy', " the ability of the electric system to supply the aggregate electric power and energy requirements of electricity consumers at all times, taking into account scheduled and reasonably expected unscheduled outages of system components" is used by NERC as a analogue of Australia's NEMs "reliability". The NERC analogue of the NEMs "security" is termed "Operating reliability" and refers to "the ability of the electric system to withstand sudden disturbances such as electric short circuits or unanticipated loss of system components"[287].

The AEMC Reliability Panel reports NEM reliability performance annually in terms of USE in the Annual Market Performance Review.

Reliability of the distribution sector is reported using standards such as System Average Interruption Frequency Index (SAIFI), System Average Interruption Duration Index (SAIDI) and Customer Average Interruption Duration Index (CAIDI) and in some cases Momentary Average Interruption Frequency Index (MAIFI).[288]

The AEMO is responsible for maintaining security of supply in the NEM in line with the security standards outlined in the NER. The NER defines a satisfactory operating state that requires:

- frequency within limits
- voltage within limits
- current flows within ratings
- plant being operated within limits
- potential faults within circuit breaker capabilities
- power system conditions are stable

The above states are defined in the following technical standard frameworks:

- **System standards** define the performance of the power system, the nature of the electrical network and the quality of power supplied.
- **Access standards** specify the performance standards required in order to gain access to the network.
- **Plant standards** set out the technology specific standards that if met by particular facilities would ensure compliance with the access standards.

AEMO's role is to maintain the power system in a secure operating state, meeting the above limits and technical standards. As with reliability, the system must comply with these standards following a single credible contingency event only.[289] Security performance is reported by the AEMC Reliability Panel in the Annual Electricity Market Performance Review.[290]

There are no overall NEM criteria for security however the following security related criteria are reported:

- actual and forecast minimum reserve levels
- maximum demand forecasts
- transmission outages
- accuracy of AEMO forecasts (medium term, short term and pre-dispatch)
- multiple contingency events
- frequency (no. of excursion events per year and duration; standard deviation of frequency), voltage and system stability
- inherent system aspects to address security
- power system directions (security safety net)

Much of the data used by AEMO to ascertain if the NEM is operating in a secure fashion is not publically reported and there is currently no reported overall system wide indicator for security. This situation is further constrained by the NER (Version 45, clause 4.2.4 p.293) defining the power system (NEM) as operating in a secure state if the AEMO, in its "reasonable opinion", considers it is secure.

Publication of indicators measuring NEM current and historical performance against an overall security indicator is suggested as a valid measure to aid transparency, to benchmark security and also to measure improvements in the security of electricity supply in the NEM. An example of what can be achieved may be seen on the North American Electric Reliability Corporation (NERC) interactive reliability indicator website http://www.nerc.com/page.php?cid=4%7C331.

This information provides assessment and trends on far more reliability and security indicators than currently reported in the NEM. It is our opinion that a similar level of information availability would aid development and planning in the NEM.

4.5.3. BILLS AND PRICES

The analysis of electricity bills as a proportion of household income, and analysis of residential, business and small business electricity prices highlights a series of issues:

1. Electricity prices in Australia are rising rapidly, however they are still some of the lowest in the world.
2. While residential electricity prices are significantly higher than business electricity prices, small business electricity prices are rising fastest
3. Electricity bills as a proportion of household income declined between 2003–04 and 2009–10. While there have been two significant electricity price rises since then, there has also been a trend to use less electricity.[291] As such it is likely that electricity bills as a proportion of household income in NEM states are still some of the lowest in the world.

Additionally, during the development of this report a series of issues have arisen about the choice between price-based indicators and bills-based indicators for inclusion in the NEO. While the price of electricity is an obvious choice for a KPI, what consumers actually feel is the bill they pay. Focusing solely on price only takes into account energy supply; it is a supply-side KPI. This is unsurprising given the strong supply-side focus the NEM to date. However, consumer electricity bills are a function of both supply and demand – the electricity price *and* the amount of electricity that consumers use.

The inclusion of electricity price as the criterion in the NEO instead of customer electricity bills also leads to a series of tensions with other existing and potential criteria for the long term interest of consumers. For example, a focus on keeping prices low often results in a lack of incentive to undertake energy efficiency and demand management measures, leading to large electricity consumption growth rates and associated growth in electricity bills. Further, keeping prices low can come at the expense of sufficient investment to keep the NEM operating reliably and securely. Additionally, making it a requirement for organisations in the NEM to work to keep electricity prices low makes it likely they will oppose the inclusion of social and environmental externalities if they raise prices, even if ignoring such externalities may not be in the long term interest of consumers. One example of this is increasing greenhouse gas emissions.

Two conclusions can be drawn from this discussion. Firstly, that within any set of criteria for the long term interest of consumers, there will be tensions and as such compromises might have to be made, as win-win-win solutions may not always be available. However, by including a comprehensive range of criteria for the long term interest of consumers in the NEO, trade-offs that are currently implicit will be made explicit and thus more transparent. Secondly, electricity bills are a much more appropriate indicator of the long term interest of consumers than electricity price in isolation.

5. CONCLUSIONS AND RECOMMENDATIONS

Based on the analysis in this Report Card, a number of conclusions can be drawn and three recommendations are offered. Two relate to reporting performance of the NEM against the NEO and one relates to the NEO itself and responsibility within the NEM for protecting the social and environmental aspects of the long term interests of consumers.

The first conclusion is that there is quite limited publicly available data on the performance of the NEM in relation to the long term interest of consumers. This is the case for the existing and possible additional criteria included in the National Electricity Objective. Whichever criteria are included in the objective of the National Electricity Market, it is crucial that more relevant, reliable and consistent data be collected and reported. It is therefore desirable that more comprehensive reporting be undertaken with regards to NEM performance.

While organisations such as AEMO, AER and AEMC report extensively on different aspects of the NEM, currently no organisation has responsibility for directly reporting on NEM performance with respect to the NEO. The purpose of reporting against the NEO annually would be to ensure consumers can accurately assess NEM operation and decision making.

It is recommended that such reporting should be in a format similar to this Report Card. This should involve annual reporting against specific KPIs and benchmarks relevant to the long term interest of electricity consumers. These could be included in the AER's annual State of the Energy Market Report. This annual reporting should highlight where the NEM is performing well and help to identify potential areas for improvement.

Such reporting could also provide an informal trigger to address areas where the NEM may be found to be performing poorly. This would be analogous to current arrangements in the spot market price for electricity in the NEM. When the spot market price exceeds $5000/MWh it triggers the AER to undertake a report investigating the cause of the high price event. A KPI which scores particularly poorly relative to a target or benchmark in an annual report of NEM performance against the NEO could similarly trigger an investigation as to the cause and identify strategies to improve performance.

The lack of adequate reporting against the NEO is a clear gap in the NEM that can and should be addressed. One way to effect this could be via a change to the National Electricity Rules, however more informal options are also available. Whatever means are adopted to enact such a recommendation, it is important that they be supported and endorsed by the state, territory and federal energy ministers, through the Standing Council on Energy and Resources (SCER).

Recommendation 1: That the Standing Council on Energy and Resources requires annual public performance reporting of the National Electricity Market against the criteria of the National Electricity Objective.

A second conclusion that arises from the Report Card analysis is that there is very limited publicly available data with regards to several of the KPIs. These KPIs are important for understanding how the NEM is performing with respect to both the existing and proposed criteria for the long term interest of consumers. As such, it is recommended that further reporting be undertaken with regards to NEM performance in the areas of:

- Customer Bills
- Energy Efficiency
- Demand Management
- Protection of Vulnerable Customers
- Customer Satisfaction
- Security of Supply
- Safety
- Level of Competition.

The KPIs that lack data relate to both criteria currently included in the NEO as well as areas currently excluded from the NEO. There is a notable lack of information available on the demand side of the market, while supply side reporting is relatively more accessible.

Recommendation 2: That public reporting on the performance of the NEM should be extended for the consumer side of the market, particularly in relation to customer bills, customer energy efficiency, demand management, protection of vulnerable customers and customer satisfaction.

In the most recent round of reforms of the National Electricity Market, social and environmental objectives were deliberately excluded from the NEO. Research for this report indicates that consumer advocates clearly identify that the social and environmental impacts of the NEM affect the long term interest of consumers. The Report Card results suggest that the current policy of seeking to achieve social and environmental outcomes in the electricity sector only through policies external to the NEM and the NEO has not delivered very good results either in practice or according to stakeholders perception, and may even have adversely impacted on some consumer interest criteria *within* the NEO, such as price. Given that all decisions in the NEM are considered against the NEO, there is likely to be significant benefit in incorporating environmental and social criteria for the long term interest of consumers into the NEO. International precedents for the inclusion of social and environmental consideration into the formal objectives of the electricity markets can be found in the US, Canada and the UK.

Recommendation 3: That the National Electricity Objective should be amended to incorporate social and environmental criteria for the long term interest of consumers in addition to the existing technical and price criteria.

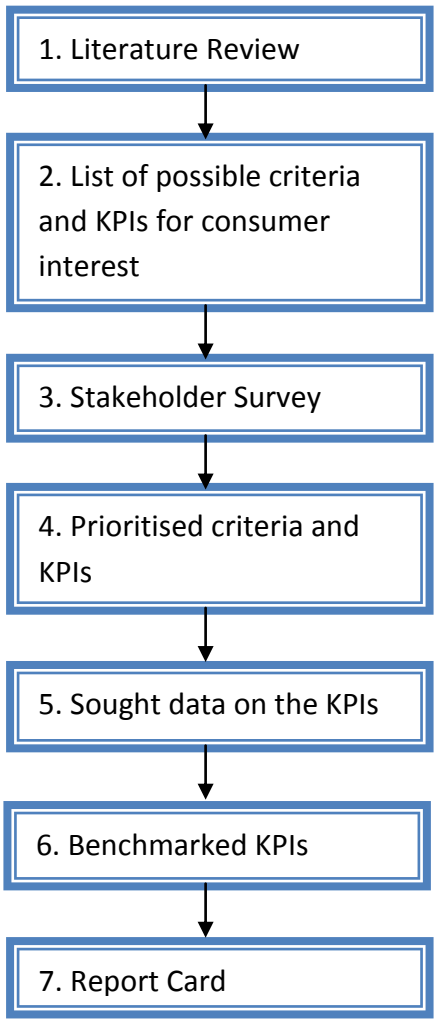
This Report Card has found that the NEM is not performing well against a series of social and environmental criteria, such as customer satisfaction, protection of vulnerable consumers, greenhouse gas emissions (both total emissions and emissions intensity per unit of energy generated), demand management, energy efficiency and renewable energy. Including the full range of criteria for the long term interests of consumers in the NEO, would make the implicit trade-offs that are already being made more transparent within the decision making processes of the NEM.

While the inclusion of social and environmental criteria within the NEO would probably not lead to immediate changes in the operation or performance of the NEM, their inclusion would be likely to lead to consideration of policy and rule changes where appropriate and greater attention by NEM institutions to addressing poor performance in these areas.

APPENDIX A – REPORT CARD METHODOLOGY

Given the debate around the objectives and performance of the NEM (Section 3), the following method was developed to define the 'long-term interests of consumers' and assess the NEM's performance according to the criteria identified for consumers' long term interests. The methodology is in seven parts as identified in Figure 36. The first six parts are outlined in this methodology, as they form the basis for the Report Card (Part 7) and the subsequent development of recommendations.

Figure 36: NEM Report Card methodology flow chart



A.1 PART 1 – LITERATURE REVIEW

An initial literature review was undertaken of academic articles, inquiry submissions, and a wide range of relevant industry reports, both Australian and international,. As with the survey, the literature review sought to identify the opinions of stakeholders on the NEO and the performance of the NEM by examining evidence from the literature. Additionally, this process informed the development of a stakeholder survey, particularly identifying which key performance indicators (KPIs) and criteria for long term interests of consumers could

and should be considered in this project. The literature review also informed the KPI scoring process and the discussion of implications.

The literature review focused on the key questions below.

1. What statements have been made about the NEM related to the long term interests of consumers from organisations involved in the NEM?
2. How have other related national and international organisations approached their overarching electricity system objectives?
3. How successful have these approaches been? What evidence is available?
4. What steps have been proposed for changing the NEM to better reflect the 'long term interests of consumers of electricity'?
5. What steps have been taken to date within the NEM to meet both the National Electricity Objective (NEO) and the 'long term interests of consumers of electricity'?
6. Are environmental interests an integral part of the 'long term interests of consumers of electricity'?
7. Should the NEM include additional environmental or social criteria beyond those specified in the NEO?
8. What are the key issues associated with the NEM's performance in the long term interest of consumers?
9. To what extent are Distributed Energy (DE) and Demand Side Participation (DSP) integral to the 'long term interests of consumers'?
10. How effective has the NEM been in encouraging distributed energy and demand side participation?
11. Is the energy market framework frustrating efforts to meet the 'long term interests of consumers of electricity? If yes, why/how? If no why not?

A.2 PART 2 – LIST OF POSSIBLE CRITERIA AND KPIS FOR CONSUMER INTEREST

The choice of performance measures can have a powerful impact on the behaviour of institutions. As author and Club of Rome member Donella Meadows observed, "indicators arise from values (we measure what we care about) and they create values (we care about what we measure)" (Meadows, 1998, p2). This is particularly true of the criteria for the long term interests of consumers chosen for inclusion in the National Energy legislation. As discussed in Section 0, the five criteria stated in the NEO[1] reflect what the architects of the NEM "cared about" or considered to be priorities, with respect to the long term interests of electricity consumers. (While this report separates the NEO into five sub-objectives, the relationship between these is often equally important. For example, in certain cases the pursuit of one objective may act in opposition to another objective. This is often the case when reliability is reduced in the case of a customer interruption in order to maintain overall

system security.) Further, these indicators define the scope of what NEM organisations are required to consider, potentially at the expense of other possible criteria for the long term interests of consumers. The criteria within the NEO imply the use of KPIs, because evaluation is required as to whether a criterion is being met. As such, the format of the Report Card is based on a series of criteria for the long term interests of consumers and associated performance measures or KPIs.

From both the NEO and the literature review a list of 13 possible criteria for the long-term interest of consumers were identified:

1. Electricity Price
2. Electricity quality
3. Electricity and electricity system safety
4. Reliability of electricity supply and the national electricity system
5. Security of electricity supply and the national electricity system
6. Customer bills
7. Environmental performance
8. Customer demand management
9. Customer energy efficiency
10. Level of competition
11. Protection of vulnerable consumers
12. Customer satisfaction
13. Responsiveness to the community

From the literature review, a series of possible KPIs for each of the 13 criteria were identified.

A.3 PART 3 – STAKEHOLDER SURVEY

To gain stakeholder input into the Report Card process a survey was developed. A copy of the survey is in Appendix C. The objective of the survey was to identify the views of these key stakeholders on:

a) What they think are the long-term interests of electricity consumers
b) What they believe to be the best KPIs that measure the performance of the NEM with respect to a)
c) The adequacy of the current National Electricity Objective
d) How well they think the NEM is performing with respect to the current objective.

The NEM Report Card Survey was sent to 56 organisations across a range of sectors (see Appendix B for a full list). Reflecting the more disaggregated nature of consumer and environmental advocacy, a larger number of these organisations were approached in each sector. A total of 29 usable responses were received. The respondents are listed by organisational type in Table 53.

Table 53: Number of participants invited and responding in the survey

Organisational Category	Participants Invited No.	Survey Respondents No.
Consumer Advocates – Small Energy Users (residential and business)	17	12
Consumer Advocates – Medium to Large Energy Users	5	1
Electricity Industry – Clean Energy	7	6
Electricity Industry – Fossil Fuel	4	1
Electricity Industry – Retailers	1	0
Electricity Industry – Networks	1	1
Unions	4	1
Environmental Groups	13	6
Government Organisations	4	1
Total	56	29

A.4 PART 4 – CRITERIA AND KPI PRIORITISATION

The survey results were the primary basis for selecting criteria and associated KPIs for inclusion in the Report Card. Specifically, the answers to the survey question *how important are the following KPIs for inclusion in this Report Card*, were ranked. To provide a robust analysis three rankings were applied, the first was a straight average of all participants' answers. However, given that a large number of responses were from consumer and environmental advocates, a second ranking gave an equal weight to all *organisation types* regardless of the number of survey respondents. The third ranking was based purely on the responses of residential consumer advocates, to provide a consumer advocate perspective on what represents the interests of consumers.

Table 54 presents the KPIs which scored in the top 15 of at least one of the three rankings. For the all participants and consumer advocates rankings of many of the highly scored KPIs are related to the long term interests of consumer criteria which are not currently included in the NEO. One possible explanation for this is that survey participants could have been rating highly KPIs which they do not feel the NEM is currently addressing adequately. Despite differences in ranking there is some degree of agreement between the three ranking methods, particularly in relation Electricity Price.

Figure 36 and Figure 38 graphically show the top 15 KPIs ranked by all participants' responses and by organisational type respectively and Figures 38 and 39 show the ranking of the remaining KPIs listed in the survey. Note, the colours of the bars in these figures correspond to their associated criteria for the long term interests of consumers.

Table 54: Average rank for each KPI and criteria

Note * Indicates those KPIs that have been included in the Report Card

Criteria	KPI	Average Rank (by weighted score)		
		All respondents	Organisational Category	Residential Consumer Advocate
Price	Retail price of electricity for residential customers (c/kWh)*	1	1	1
Environmental performance	Annual greenhouse gas emissions from the electricity sector (tonnes CO2e/year)*	2	22	2
Level of Competition	Extent of market concentration*	=3	7	=3
Environmental performance	Greenhouse gas intensity of electricity supply (kg CO2e/MWh)*	=3	17	=3
Protection of vulnerable customers	Number of disconnections of residential customers on payment plans and pensions*	5	26	=3
Customer Bills	Average annual residential customers electricity bill as a proportion of household income*	6	8	=3
Customer satisfaction	Number of complaints per year*	7	3	=12
Protection of vulnerable consumers	Number of households that are 'energy poor' i.e. electricity costs are greater than 10% of household budget*	8	4	19
Customer satisfaction	Surveyed customer satisfaction levels*	9	5	16
Price	Retail price of electricity for small business customers (c/kWh)*	=10	2	22
Environmental performance	Renewable energy as a proportion of total electricity generation (% of total MWh)*	=10	24	=12
Energy Efficiency	Electricity savings from energy efficiency programs as percentage of total electricity consumed (% of total MWh)*	12	37	11
Demand management	Proportion of peak demand met through demand management programs (% of total MW peak)*	13	41	=7

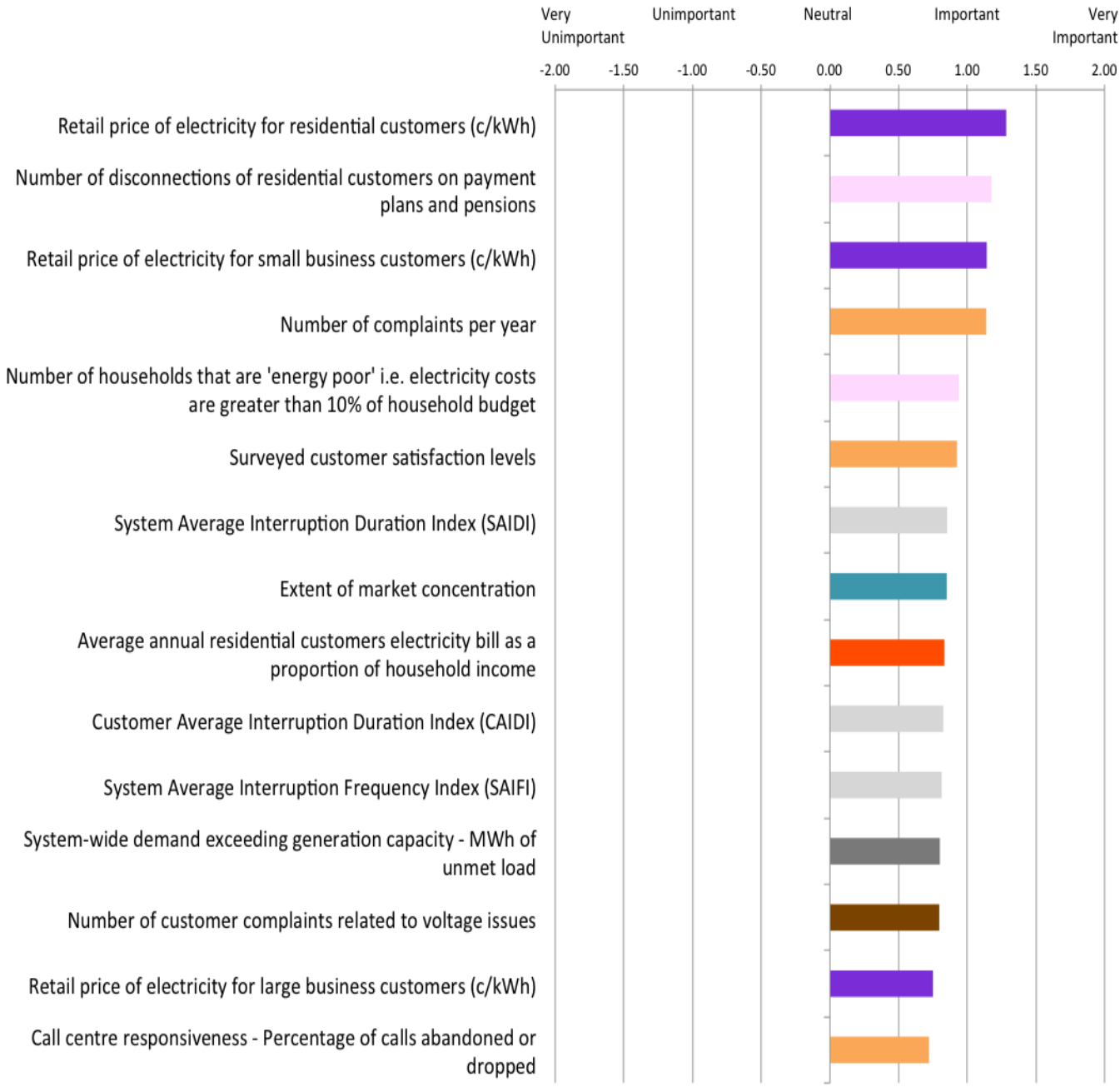
Reliability	System Average Interruption Duration Index (SAIDI)*	14	6	15
Demand management	Average demand as a percentage of peak demand (% of total MWpeak)	15	27	=12
Level of Competition	Retail electricity margins	=20	35	=7
Energy Efficiency	Energy intensity (kWh per capita)*	=20	36	19
Protection of vulnerable customers	Number of disconnections	=22	20	=7
Security of supply	System-wide demand exceeding generation capacity - MWh of unmet load*	=22	11	=25
Safety	Number of significant electricity incidents per year associated with the electricity supply industry*	24	16	=25
Protection of vulnerable consumers	Number of disconnections more than once at the same address	18	25	10
Reliability	Customer Average Interruption Duration Index (CAIDI)	16	9	25
Reliability	Momentary Average Interruption Frequency Index (MAIFI)	29	15	33
Reliability	System Average Interruption Frequency Index (SAIFI)	16	10	19
Quality	Number of customer complaints related to voltage issues	32	12	37
Price	Retail price of electricity for large business customers (c/kWh)	27	13	36
Customer satisfaction	Call centre responsiveness - Percentage of calls abandoned or dropped	31	14	37

Figure 37: Top 15 KPIs – Ranking based on average of *all* survey *participants*

Note: 5= Very high importance, should definitely be used as indicator in the NEM Report Card and 1= Very low importance should definitely not be used as indicator in the NEM Report Card. Thus the higher the score, the more people think it is an important indicator to include in the Report Card

(See Table 54 for colour code reference.)

Figure 38: Top 15 KPIs – Ranking based on average of *organisational category*



Note: 5= Very high importance, should definitely be used as indicator in the NEM Report Card and 1= Very low importance should definitely not be used as indicator in the NEM Report Card. Thus the higher the score, the more people think it is an important indicator to include in the Report Card

(See Table 54 for colour code reference.)

Figure 39: Remaining KPIs – Ranking based on average of *all* survey *participants*

Figure 40: Remaining KPIs – Ranking based on average of *organisational category*

The criteria selected for analysis for the Report Card included all those in the current NEO as they reflect what major stakeholders, i.e. the architects of the NEM, considered to be crucial to the long term interests of consumers. This is despite the fact that most of the KPIs associated with these criteria (with the exception of residential electricity price) did not score highly in the "all participant" and "consumer advocate" rankings (Table 54). There is one current NEO criterion for which none of the surveyed KPIs were used in the Report Card – Quality, as it was not possible to find reliable data for the quality related KPIs included in the survey. Instead an alternative KPI was presented as described in section 4.4.3.

Additional criteria selected for analysis and inclusion in this Report Card were those that corresponded with the top 15 KPIs weighted by all survey participants, thus representing the collective wisdom of consumer representatives, market stakeholders and experts. It should be noted that the 'all participants' ranking and 'consumer advocates' ranking closely correlate, due to the large number of consumer advocate responses. The list of criteria and KPIs analysed in this report are listed in Table 55.

Table 55: Criteria and KPIs included in the Report Card

CRITERIA	KEY PERFORMANCE INDICATOR
Reliability	System Average Interruption Duration Index (SAIDI)
	Reliability unserved energy
Security of supply	Estimated security unserved energy
Quality	Customer Severity Index
Safety	Lost time injury frequency
Price	Retail price of electricity for residential customers (c/kWh)
	Retail price of electricity for small business customers (c/kWh)
Customer bills	Average annual residential customers electricity bill as a proportion of household expenditure
Environmental performance	Annual greenhouse gas emissions from the electricity sector (tonnes CO_2e/year)
	Greenhouse gas intensity of electricity supply (kg CO_2e/MWh)
	Renewable energy as a proportion of total electricity generation (% of total MWh)
Energy efficiency	Electricity savings from energy efficiency programs as percentage of total electricity consumed (% of total MWh)
Demand management	Proportion of peak demand met through demand management programs (% of total MW peak)
Protection of vulnerable customers	Number of disconnections of residential customers on payment plans and pensions
	Number of households that are 'energy poor' (electricity costs are greater than 10% of household budget)
Customer satisfaction	Number of complaints per year
	Surveyed customer satisfaction
Level of competition	Extent of market concentration

A.5 PART 5 – KPI DATA

Once the KPIs which best reflected the long-term interests of consumers were chosen, the best method for measuring each KPI was determined. To provide a grade for each KPI, the current status of each KPI was assessed using the most recent available data. As some criteria had more than one KPI, after each KPI was graded, they would be aggregated into an overall grade for each criterion, by taking a simple average.

To score the KPIs, a baseline measurement needs to be selected for each KPI. This indicates the period of time that the performance is assessed over. There are three broad base measurements that can be selected for each KPI:

- **Current status** – an absolute or "snapshot" measure;
- **Short term trend** – Annual change over time, such as this year's performance compared with last year; and
- **Longer term trend** – Change over a period of time, for example the period from prior to the introduction of electricity market reforms and the founding of the NEM, 1990 to now.

Wherever possible, this Report Card focuses on how the electricity sector in Australia has changed due to the introduction of the NEM. Thus, the preferred period selected was 1990 until the most recently available data – that is the decade prior to the introduction of the NEM and the decade since its introduction. This time period from 1990 enables analysis of the change that the NEM reforms have had on different measures of long term consumer interest. Therefore, indicators that show the change over time were prioritised for inclusion in the Report Chard. This approach also minimises the effect of "noise" of annual change and instead examines the long-term trend. However, if this Report Card were to become an annual process, using annual change measures would be more appropriate. As such, where there was insufficient data to look over the longer time period, an annual change measure has been used. Also on a limited number of KPIs a current status "snapshot" measure was used, where it was deemed that this information provided valuable additional insight.

Determining the most appropriate base measure and associated benchmark has been a challenging process and the results should therefore be read with some caution. Extensive research was undertaken into the data for each KPI, however, the process was constrained by the data available to measure and benchmark against. In many cases, it was concluded that data available in the NEM simply was not transparent enough to provide a robust performance analysis. Additionally, it should be noted that the scoring of each KPI selected for review in this Report involves a different approach to baseline data and benchmarking. Different approaches to baseline data and benchmarking can yield different grades, providing a different indication of how the NEM is performing.

A.6 PART 6 – KPI BENCHMARKING

Benchmarking is the process of comparing something to a standard. There are a number of possible approaches benchmarking.

The purpose of this Report Card is to understand how well the NEM is operating in the long term interests of consumers. The functioning of the NEM is a result of a range of factors, including current and historical regulations, institutions and practices (discussed in Sections 0, 1 and 2) as well as the specific Australian context – for example, the fact that Australia has a large land area with a low population density. As such, within the context of this Report Card, all benchmarking approaches have benefits and limitations. If an international benchmarking approach is used, where NEM data is compared to an international standard, Australian context-specific factors are ignored, however the impact of the Australian regulatory approaches is highlighted. If current NEM performance is compared to historical NEM performance, Australian context factors and past Australian energy regulation are considered, but alternative approaches to energy regulation not used in Australia are not. Preference is given in this report to international benchmarking, as it enables the broadest possible comparison of best practice regulation of electricity with respect to the long term interests of consumers.

However, the question of which exact benchmarking approach to use for each KPI was mainly answered by the availability of data. Despite extensive research, it has not been possible to use one consistent benchmarking approach in this Report Card as there are significant data gaps or limitations both in baseline Australian data and in international and national benchmarking data. As such, the benchmarking approaches adopted in this report are (in descending order of preference):

- Comparing NEM data to OECD country data, specifically where the NEM ranks.
- Comparing NEM data to non-OECD or partial OECD international data, specifically where the NEM ranks.
- Comparing a NEM trend to progress towards a common international target.
- Comparing a NEM trend to progress towards an explicit Australian target.
- Comparing current NEM performance to historical NEM performance, either based on a trend or based on comparison with best and worst case performance.

The output of this process is a grade from A–F (excluding E) for each KPI, where A is doing very well and F is doing very poorly. Where insufficient data is available to provide a grade, UG or ungraded is noted. The explanation of and rationale for the grading scale used for each KPI is outlined in the section of this Report devoted to that KPI (Sections 4.3.1-4.3.12).

These grades are the basis of the NEM Report Card, from which recommendations were subsequently developed.

APPENDIX B - ORGANISATIONS INVITED TO PARTICIPATE IN STAKEHOLDER SURVEY

Consumer advocates – residential

- Moreland Energy Foundation Limited
- Australian Council of Social Services
- Alternative Technology Association
- Uniting Care Australia Energy Project
- Public Interest Advocacy Centre
- Queensland Council of Social Services
- Consumer Action Law Centre
- Victorian Council of Social Services
- St Vincent de Paul Society
- Consumer Utilities Advocacy Centre
- Council on the Ageing (SA)
- NSW Council of Social Services
- Tasmanian Council of Social Service
- South Australian Council of Social Service
- Energy and Water Consumers' Advocacy Program
- Ethnic Communities Council of NSW
- Choice
- Credit, Commercial and Consumer Law Program (CCCL) QUT

Consumer advocates – business

- Business Council of Australia
- Australian Industry Group
- Major Energy Users Incorporated
- Shopping Centre Council
- Energy Users Association of Australia

Electricity industry - clean energy

- Clean Energy Council
- Australian Alliance to Save Energy
- Australian Solar Energy Society
- Bioenergy Australia
- Energy Efficiency Council
- Australian Geothermal Energy Association Inc

Electricity industry - fossil fuel

- National Generators Forum/Loy Yang Marketing Management Company
- National Generators Forum
- Energy Supply Association Australia
- Minerals Council of Australia

Electricity industry - retailers

- Energy Retailers Association of Australia

Electricity industry - networks

- Energy Networks Association

Unions

- ACTU
- ETU
- AMWU
- United Voice

Environmental groups

- TCI
- ACF
- Greenpeace
- Beyond Zero Emissions
- Nature Conservation Council NSW
- Environment Victoria
- Queensland Conservation Council
- Conservation Council of South Australia
- Environment Tasmania
- CANA
- AYCC
- ASEN
- WWF

Government organisations

- Utility Regulators Forum
- Australian Local Government Association
- Energy and Water Ombudsman NSW
- Energy and Water Ombudsman Victoria

APPENDIX C - NEM STAKEHOLDER SURVEY

1. Introduction

Thank you for taking the time to fill in the National Electricity Market (NEM) Report Card Survey.

This survey is being undertaken on behalf of the Total Environment Centre, funded by the National Electricity Consumer Advocacy Panel and has been developed by the Institute for Sustainable Futures (ISF), University of Technology Sydney. The survey will inform the development of a NEM Report Card, the purpose of which is to assess through a consultative process whether and to what extent the NEM is meeting the long term interests of consumers. By completing this 10-15 minute survey, your valuable input will be incorporated into the NEM Report Card methodology and output. We will send the project final report to all survey participants .

Background details on the operation of the NEM can be found at this link.

When taking the survey, you are able to browse forward and back through the survey at any time but your responses will not be submitted until you click on "Done" on the final page. Once you click on this button your response will be submitted and you will not be able to edit your responses unless you contact us directly to have your survey reset.

If you have any questions, please contact Nicky Ison at ISF: Nicola.Ison@uts.edu.au or call us on 02-9514-4839.

2. Organisational Details

Privacy and Confidentiality

We are requesting some information about you so we can better characterise our analysis. However, results of this survey will be only be published in aggregate and all individual responses will be kept confidential.

No individual survey responses will be shared with other parties and no individual respondents will be identified. Any optional written comments that you may wish to make may be quoted in the survey report, but they will not be personally attributed.

*** 1. First Name**

*** 2. Last Name**

*** 3. Organisation**

3. Your views on how well the NEM is meeting the long terms interests of consu...

The primary objective of the National Electricity Market (NEM) concerns the long term interests of consumers. Specifically, the stated National Electricity Objective in the National Electricity Law is:

> "To promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity with respect to –
> 1. price, quality, safety, reliability, and security of supply of electricity; and
> 2. the reliability, safety and security of the national electricity system."

The questions on this page relate to your views on to what extent the NEM is currently operating in the long term interests of consumers.

*** 1. To what extent do you believe the overall National Electricity Market is currently promoting the efficient investment in and operation and use of, electricity services for the long term interests of electricity consumers?**

- ◯ Very well
- ◯ Well
- ◯ Average
- ◯ Poorly
- ◯ Very Poorly
- ◯ Not sure

*** 2. The National Electricity Market is made up of several elements including electricity generation, transmission, distribution, retailing and regulation and oversight.**

To what extent do you think these elements of the NEM are currently operating in the long term interests of electricity consumers?

	Very well	Well	Average	Poorly	Very Poorly	Not sure
Generation	◯	◯	◯	◯	◯	◯
Transmission	◯	◯	◯	◯	◯	◯
Distribution	◯	◯	◯	◯	◯	◯
Retailing	◯	◯	◯	◯	◯	◯
Regulation and oversight	◯	◯	◯	◯	◯	◯

*** 3. The existing criteria for long term interests of consumers as stated in the National Electricity Objective are price, quality, safety, reliability and security of electricity supply.**

How well do you believe the National Electricity Market is performing with respect to these existing criteria?

	Very well	Well	Average	Poorly	Very poorly	Unsure
Price	◯	◯	◯	◯	◯	◯
Quality	◯	◯	◯	◯	◯	◯
Safety	◯	◯	◯	◯	◯	◯
Reliability	◯	◯	◯	◯	◯	◯
Security of electricity supply	◯	◯	◯	◯	◯	◯

*** 4. In addition to the criteria currently included in the National Electricity Objective, there are various other criteria that might be seen as relevant to the long term interests of consumers.**

How well do you believe the National Electricity Market is performing with respect to these other criteria?

	Very well	Well	Average	Poorly	Very poorly	Unsure
Environmental performance	◯	◯	◯	◯	◯	◯
Customer bills	◯	◯	◯	◯	◯	◯
Protection of vulnerable consumers	◯	◯	◯	◯	◯	◯
Level of Competition	◯	◯	◯	◯	◯	◯
Demand management*	◯	◯	◯	◯	◯	◯
Customer energy efficiency	◯	◯	◯	◯	◯	◯
Customer satisfaction	◯	◯	◯	◯	◯	◯
Responsiveness to the community	◯	◯	◯	◯	◯	◯

*Note Demand Management includes peak load management, demand side response, distributed generation, time of use metering and time of use pricing.

5. What other criteria should be used to evaluate the NEM?

4. Your views of what the long term interests of consumers are

In the previous section, we asked you to consider how well the National Electricity Market is performing with regards to different criteria for the long term interests of electricity consumers.

In order to compile a Report Card we need to score the performance of the National Electricity Market, wherever possible using clearly measurable and objective data for each criterion.

Thus, in this section, we want to know what you think are the most important criteria and associated indicators for long term interest of electricity consumers.

Please rate the level of importance of the following indicators. The results will form the basis for NEM Report Card of how well the NEM is performing in the long term interests of consumers.

Note: Selecting the "Very High" box indicates that you think this indicator definitely should be included the NEM Report Card. Selecting the "Very Low" box indicates that you think this indicator definitely should not be included in Report Card.

* 1. Criteria - Safety

	Very high	High	Medium	Low	Very low	Unsure
A. Number of electricity sector worker injuries per year	◯	◯	◯	◯	◯	◯
C. Number of significant electricity incidents per year associated with the electricity supply industry	◯	◯	◯	◯	◯	◯
E. Number of residences affected by unacceptably high electro-magnetic fields from the electricity supply industry	◯	◯	◯	◯	◯	◯

Comment including any alternative or additional safety related indicators

* 2. Criteria - Quality

	Very high	High	Medium	Low	Very Low	Unsure
A. Number of customer complaints related to voltage issues	◯	◯	◯	◯	◯	◯
B. Number of customer complaints related to electrical current issues	◯	◯	◯	◯	◯	◯
C. Number of customer complaints related to other power quality issues e.g. electrical noise, harmonics and interference.	◯	◯	◯	◯	◯	◯

Comment including any alternative or additional quality related indicators

* 3. Criteria - Reliability

	Very high	High	Medium	Low	Very low	Unsure
A. System Average Interruption Duration Index (SAIDI)	◯	◯	◯	◯	◯	◯
B. System Average Interruption Frequency Index (SAIFI)	◯	◯	◯	◯	◯	◯
C. Customer Average Interruption Duration Index (CAIDI)	◯	◯	◯	◯	◯	◯
D. Momentary Average Interruption Frequency Index (MAIFI)	◯	◯	◯	◯	◯	◯

Comment including any alternative or additional reliability related indicators

* 4. Criteria - Security of supply

	Very high	High	Medium	Low	Very low	Unsure
A. System-wide demand exceeding generation capacity - MWh of unmet load	◯	◯	◯	◯	◯	◯

Comment including any alternative or additional security of supply related indicators

* 5. Criteria - Electricity Price

	Very high	High	Medium	Low	Very low	Unsure
A. Retail price of electricity for residential customers (c/kWh)	◯	◯	◯	◯	◯	◯
B. Retail price of electricity for small business customers (c/kWh)	◯	◯	◯	◯	◯	◯
C. Retail price of electricity for large business customers (c/kWh)	◯	◯	◯	◯	◯	◯

Comment including any alternative or additional electricity price related indicators

* 6. Criteria - Customer Bills

	Very high	High	Medium	Low	Very low	Unsure
A. Average annual residential customers electricity bill	◯	◯	◯	◯	◯	◯
B. Average annual residential customers electricity bill as a proportion of household income	◯	◯	◯	◯	◯	◯
C. Average annual commercial customers electricity bill	◯	◯	◯	◯	◯	◯
D. Average annual industrial customers electricity bill	◯	◯	◯	◯	◯	◯
E. Total national cost of electricity bills as a percentage of Australian economy ($/$ GDP)	◯	◯	◯	◯	◯	◯

Comment including any alternative or additional customer bills related indicators

* 7. Criteria - Environmental performance

	Very high	High	Medium	Low	Very low	Unsure
A. Annual greenhouse gas emissions from the electricity sector (tonnes CO2e/year)	◯	◯	◯	◯	◯	◯
B. Greenhouse gas intensity of electricity supply (kg CO2e/MWh)	◯	◯	◯	◯	◯	◯
C. Renewable energy as a proportion of total electricity generation (% of total MWh)	◯	◯	◯	◯	◯	◯
D. Renewable energy as a proportion of total installed capacity (% of total MW)	◯	◯	◯	◯	◯	◯
E. Impact on local air quality	◯	◯	◯	◯	◯	◯
F. Impact on local water quality	◯	◯	◯	◯	◯	◯
G. Impact on local visual amenity	◯	◯	◯	◯	◯	◯

Comment including any alternative or additional environmental performance related indicators

* 8. Criteria - Competition

	Very high	High	Medium	Low	Very low	Unsure
A. Extent of market concentration	◯	◯	◯	◯	◯	◯
B. Customer churn rate	◯	◯	◯	◯	◯	◯
C. Retail electricity margins	◯	◯	◯	◯	◯	◯

Comment including any alternative or additional competition related indicators

* 9. Criteria - Protection of vulnerable consumers

	Very high	High	Medium	Low	Very low	Unsure
A. Number of households that are 'energy poor' i.e. electricity costs are greater than 10% of household budget	◯	◯	◯	◯	◯	◯
B. Number of disconnections	◯	◯	◯	◯	◯	◯
C. Number of disconnections of residential customers on payment plans and pensions	◯	◯	◯	◯	◯	◯
D. Number of disconnections more than once at the same address	◯	◯	◯	◯	◯	◯
E. Percentage of residential customers who had security deposites held	◯	◯	◯	◯	◯	◯
F. Percentage of residential security deposits held for longer than 12 months	◯	◯	◯	◯	◯	◯

Comment including any alternative or additional social equity related indicators

* 10. Criteria - Customer satisfaction

	Very high	High	Medium	Low	Very low	Unsure
A. Number of complaints per year	◯	◯	◯	◯	◯	◯
B. Call centre responsiveness - Percentage of calls abandoned or dropped	◯	◯	◯	◯	◯	◯
C. Surveyed customer satisfaction levels	◯	◯	◯	◯	◯	◯

Comment including any alternative or additional customer satisfaction related indicators

11. Responsiveness to the community

	Very High	High	Medium	Low	Very Low	Unsure
A. Level of engagement of consumers in NEM policy, rule and regulation processes	◯	◯	◯	◯	◯	◯
B. Surveyed public confidence in the NEM regulation and policy making	◯	◯	◯	◯	◯	◯

Comment including any alternative or additional responsiveness to the community related indicators

* 12. Criteria - Energy Efficiency

	Very high	High	Medium	Low	Very low	Unsure
A. Electricity savings from energy efficiency programs as percentage of total electricity consumed (% of total MWh)	◯	◯	◯	◯	◯	◯
B. Energy intensity (MWh per dollar of GDP)	◯	◯	◯	◯	◯	◯
C. Energy intensity (kWh per capita)	◯	◯	◯	◯	◯	◯

Comment including any alternative or additional energy efficiency related indicators

* 13. Criteria - Demand management

	Very high	High	Medium	Low	Very low	Unsure
A. Average demand as a percentage of peak demand (% of total MWpeak)	◯	◯	◯	◯	◯	◯
B. Proportion of peak demand met through demand management programs (% of total MW peak)	◯	◯	◯	◯	◯	◯
C. Percentage of customers on smart meters (% of total customers)	◯	◯	◯	◯	◯	◯
D. Percentage of customers on time of use tariffs (% of total customers)	◯	◯	◯	◯	◯	◯
E. Total capacity (MW) of approved distributed generators	◯	◯	◯	◯	◯	◯

Comment including any alternative or additional demand management related indicators

If you have other potential KPIs that could be used to rate the performace of the National Electricity Market for the long term interests of consumers, please add them here.

14. Any other KPIs or comments

5. Your views on the wording of the National Electricity Objective

The following questions ask your views on what the National Electricity Objective should be.

*** 1. Of the existing criteria, which do you think should continue to be included in the National Electricity Objective?**

	Yes	No	Not sure
Price	◯	◯	◯
Quality	◯	◯	◯
Safety	◯	◯	◯
Reliability	◯	◯	◯
Security of supply	◯	◯	◯

*** 2. Of the other possible criteria, which do you think should be included in the National Electricity Objective?**

	Yes	No	Not sure
Environmental performance	◯	◯	◯
Customer bills	◯	◯	◯
Protection of vulnerable customers	◯	◯	◯
Level of competition	◯	◯	◯
Demand management	◯	◯	◯
Energy efficiency	◯	◯	◯
Customer satisfaction	◯	◯	◯
Responsiveness to the community	◯	◯	◯

Other (please specify)

*** 3. Do you think it is preferable to have either:**

◯ A series of criteria for the long term interests of consumers listed in the National Electricity Objective; or

◯ A short National Electricity Objective without criteria such as "The National Electricity Market should operate in the long term interests of electricity consumers"?

◯ Unsure

*** 4. The National Electricity Objective is currently specific to the long term interests of "consumers of electricity". Alternatively, the objective could instead focus on the long term interest of "the nation" or "the commmunity". To what extent would you support the National Electricity Objective focusing on any of these three alternatives?**

	Strongly support	Support	Neutral	Oppose	Strongly oppose	Not sure
"The long term interests of electricity consumers"	◯	◯	◯	◯	◯	◯
"The long term interests of the nation"	◯	◯	◯	◯	◯	◯
"The long term interests of the community"	◯	◯	◯	◯	◯	◯

Other (please specify)

If you have any other comments regarding this survey, the long term interests of electricity consumers, the performance of the National Electricity Market or the wording of the National Electricity Objective, you are invited to leave them in the box below.

5. Any other comments

6. Thank you

Thank you very much for taking the time to fill in this survey. We will send you through a copy of the final project report.

If you have any questions about the National Electricity Market Report Card project or the survey specifically please don't hestitate to get in touch with Nicola Ison on nicola.ison@uts.edu.au.

The Institute for Sustainable Futures has program approval from the UTS Human Research Ethics Committee. If you have any complaints or reservations about any aspect of your participation in this research you may contact ISF Research Directors Emma Partridge (emma.partridge@uts.edu.au) or Chris Riedy (criedy@uts.edu.au), or the UTS Research Ethics Officer (tel: 02 9514 9615). Any complaint you make will be treated in confidence and investigated fully and you will be informed of the outcome.

ENDNOTES

EXECUTIVE SUMMARY

[1] DRET (2011) *Draft Energy White Paper 2011, Chapter 1,* p6. Accessed at www.ret.gov.au/energy/Documents/ewp/draft-ewp-2011/Draft-EWP-chap1.pdf

INTRODUCTION

[2] Meadows (1998), *Indicators and Information Systems for Sustainable Development,* Sustainability Institute, Hartland, VT, at 2.

PART 1

[3] R. Cantley-Smith *et al, Where is the Consumer? The Implications of Legislative & Regulatory Reforms in the National Electricity Market for Australian Consumers*, 2007, Consumers Advocacy Panel, Sydney, Australia, at 7-8.

[4] For in-depth discussion of the development of electricity markets (1901-2001 onwards) see R. Cantley-Smith *et al,* ibid, Chs 2 and 3; G. Hodge *et al* (eds), *Power Progress: An Audit of Australia's Electricity Reform Experiment,* Australian Scholarly Publishing, 2004, 167, 171. C. Weiter, 'Competition Principles and Vertically Integrated Utilities', [2002] 9(4) *Agenda* 321, 325.

[5] National Competition Commission (1998), *Overview of National Competition Policy and Compendium of Competition Policy Agreements*, 2nd ed., June, at 3-4. See also: Productivity Commission, *Industry Commission Annual Report 1990-1991*, 1991, AGPS, Canberra, www.pc.gov.au/ic/research/annualreport/annualreport9091/preliminaries.pdf; *Report On National Competition Policy* (the Hilmer Report), 1993, AGPS, Canberra, ncp.ncc.gov.au/docs/hilmer-001.pdf; the *National Competition Policy Agreements* and related documents, ncp.ncc.gov.au/pages/about#agreements, and Parliament of Australia, *Australia's National Competition Policy: Its Evolution and Operation*, 2003, Parliamentary Library, www .aph.gov.au/library/intguide/econ/ncp_ebrief.htm>. See also discussion of these and related legislative reforms in R. Cantley-Smith, D. Bowman and G. Hodge, *Where is the Consumer? The Implications of Legislative & Regulatory Reforms in the National Electricity Market for Australian Consumers*, 2007,National Electricity Consumers Advocacy Panel, Sydney, Australia.

[6] The NCP is set out in three agreements, signed by all nine Australian governments, which are reproduced in National Competition Council (1998), Compendium of National Competition Policy Agreements, 2nd ed, June, Canberra: NCCC. Available at: www.ncc.gov.au.

[7] R. Cantley-Smith, 'How Green is the Nem? The Environment and the National Electricity Market', in R. Cantley-Smith and D. Bowman (eds), *GreenPower: An Environmental Audit of the NEM,* 2009, Research Publications, Melbourne, at 22; COAG, *Communiqué* and *Attachment A – Report on Electricity Reform*, Meeting of 19 August 1994, www.coag.gov.au/coag_meeting_outcomes, and the then National Electricity Code 1998, Chapter 1, Section 1.3, Market Objectives, www .neca.com.au/files/necacode/.

[8] Tasmania's integration into the Nem occurred in 2006 with the commissioning of the Basslink Interconnector (seabed cable) on 30 April 2006 and effective participation commenced as of 29 May 2006. This subsea electricity cable was purchased by Cityspring Infrastructure Management Pty. Ltd. in august 2007. For further details on Basslink and its operations see <www .basslink.com.au/home/index.php?id=22>. it is also worth noting that the remaining jurisdictions, Western Australia and the Northern Territory, are non-participants, primarily for geographic reasons (prohibitive distances).

[9] NEMMCO (2005), at 4.

[10] Ibid.

[11] R. Cantley-Smith, D. Bowman and G. Hodge, *Where is the Consumer? The Implications of Legislative & Regulatory Reforms in the National Electricity Market for Australian Consumers*, 2007,National Electricity Consumers Advocacy Panel, Sydney, Australia, at 24-25, in particular Tables 3.1 and 3.2 outlining the stages of the move to full retail competition in Victoria and NSW.

[12] R. Cantley-Smith, D. Bowman and G. Hodge, *Where is the Consumer? The Implications of Legislative & Regulatory Reforms in the National Electricity Market for Australian Consumers*, 2007,National Electricity Consumers Advocacy Panel, Sydney, Australia, at 24-25, in particular Tables 3.1 and 3.2 outlining the stages of the move to full retail competition in Victoria and NSW.

[13] Australian Energy Regulator, *State of the Energy Market 2010*, Australian Competition and Consumer Commission, Australia, at 96-97.
[14] Australian Energy Regulator, *State of the Energy Market 2010*, Australian Competition and Consumer Commission, Australia, at 96-97.
[15] *National Electricity (South Australia) Act* 1996, No. 44 of 1996, Preamble.
[16] NGMC, National Grid Protocol, First Issue, December 1992, at i.
[17] For more information, see www.coag.gov.au.
[18] See: COAG (1994) Communiqué - Progress Report on Electricity Reform, February, and COAG (1994), Communiqué - National Competition Policy and Electricity Reforms, August. Available at: www.coag.gov.au.
[19] R. Cantley-Smith, D. Bowman and G. Hodge, *Where is the Consumer? The Implications of Legislative & Regulatory Reforms in the National Electricity Market for Australian Consumers*, 2007, National Electricity Consumers Advocacy Panel, Sydney, Australia, at 8. See also COAG (1994) Communiqué - Progress Report on Electricity Reform, February, and COAG, *Communiqué - National Competition Policy and Electricity Reforms*, August 1994. Available at: www.coag.gov.au.
[20] Australian Energy News, *Developing a National Energy Market*, (1996), Issue 2, at 1. Available at: www.isr.gov.au. See also Productivity Commission, *Industry Commission Annual Report 1990-1991*, 1991, Australian Government Publishing Service, Canberra, online at www.pc.gov.au/ic/research/annualreport/annualreport9091/preliminaries.pdf; Independent Committee of Inquiry, *National Competition Policy Review* (Hilmer Report), 1993, National Competition Council, Australian Government Publishing Service, Canberra, online at www.ncc.gov.au/images/uploads/Hilmer-001.pdf. See also discussion in Gavan McDonell (2004), 'NSW Government Ownership and Risk Management in Mandatory Pool: 'Neither Fish nor Fowl nor...', in G Hodge, V Sands, D Hayward, and D Scott (eds), *Power Progress: An Audit of Australia's Electricity Reform Experiment*, Australian Scholarly Press, Melbourne, at 78-81.
[21] R. Cantley-Smith et al, *Where is the Consumer? The Implications of Legislative & Regulatory Reforms in the National Electricity Market for Australian Consumers*, 2007,National Electricity Consumers Advocacy Panel, Sydney, Australia, at 14.
[22] House of Representatives, Standing Committee on Legal and Constitutional Affairs, Harmonisation of legal systems: Within Australia and between Australia and New Zealand, November 2006, Canberra, available at http://www.aph.gov.au, at para 2.36. In the case of the electricity markets the South Australian legislature has taken the lead role; see further discussion Part 3 of this Report on the legislative framework of the NEM.
[23] *National Electricity (South Australia) Act* 1996, No. 44 of 1996, Preamble. See COAG, February 1994 – include full citation
[24] *National Electricity (South Australia) Act* 1996, National Electricity (South Australia) Act 1996 No. 44 of 1996, as amended by *National Electricity (South Australia) (Commencement) Amendment Act* 1998 No. 32 of 1998, Schedule: *National Electricity Law.* Schedule, National Electricity Law, Part I.
[25] Ibid, Schedule, Part II, *National Electricity Code*.
[26] The foundational statute, *National Electricity (South Australia) Act 1996*, was subsequently reproduced in all of the nem's participating jurisdictions: *National Electricity (New South Wales) Act 1997*; *National Electricity (Victoria) Act 1997*; *Electricity – (National Scheme) Act 1997 (Qld); Electricity (National Scheme) Act 1997 (Act); and Electricity – National Scheme (Tasmania) Act 1999*.
[27] This related to third- party access regimes such as electricity and telecommunications.
[28] For in-depth discussion on the historical development of the national electricity market, see R Cantley-Smith, D Bowman and G Hodge, above n 2.
[29] As noted on its official website, NECA was a company incorporated under the Corporations Law and limited by guarantee. The members of NECA are the five participating jurisdictions in the national electricity market and Tasmania. NECA has been established by the participating jurisdictions in the national electricity market: the States of New South Wales, Queensland, South Australia and Victoria; and the Australian Capital Territory and is governed in accordance with its Members' Agreement and its memorandum and articles of association, see www.neca.com.au
[30] National Electricity Code 1998, s.1.5.1.
[31] Section 1.6.1, National Electricity Code 1998.
[32] Clause 3.4 of the Code.
[33] Section 1.6.3, National Electricity Code 1998.
[34] Section 1.6.2, National Electricity Code 1998. See also: www.nemmco.com.au.
[35] COAG (2001) Communiqué - Energy Policy, June, available at www.coag.gov.au.

[36] COAG (2001) Communiqué - Attachment 1: Towards a National Energy Policy, June, and COAG (2001), Communiqué - Attachment 2: A National Energy Policy Framework, June. Available at: www.coag.gov.au.
[37] COAG (2001) Communiqué - Attachment 3: Priority Actions, Attachment 4: Ministerial Council on Energy, June, and COAG (2001), Communiqué - Attachment 6: COAG Energy Review, June. Available at: www.coag.gov.au. See also COAG (2002), *Energy Market Review: Towards a Truly National and Efficient Energy Market,* December, Canberra, www.coag.gov.au. Known as the Parer Report, this document highlighted problem areas including: confused governance arrangements; perceptions of conflict of interest when governments are owners, regulators and policy makers; a 'regionalised' rather than national NEM, resulting from inadequate transmission links and arrangements; low demand side involvement in the NEM with very few effective measures for stimulating demand side management and enhancing end user participation; and significant disadvantages for regional users. See MCE response: Ministerial Council on Energy (2003), Report to COAG on Reform of Energy Market, December, Canberra: MCE. See further discussion in R. Cantley-Smith, D. Bowman and G. Hodge, *Where is the Consumer? The Implications of Legislative & Regulatory Reforms in the National Electricity Market for Australian Consumers*, 2007,National Electricity Consumers Advocacy Panel, Sydney, Australia, at 9-13.
[38] Dated 30 June 2004, this agreement set the foundation for subsequent legislative and regulatory reform across the entire energy sector. The *Australian Energy Market Agreement* 2004 overrides and replaces the *National Electricity Market Legislation Agreement* of 9 May 1996 (see clause 1.3). The *Australian Energy Market Agreement* 2004 was also recently amended in 2006. Pursuant to clause 1.1, this is now referred to as the Australian Energy Market Agreement 2004 as amended in 2006. For further discussion see e.g. Ministerial Council on Energy, Standing Committee of Officials, Legislative and Regulatory Framework, 2004; National Electricity Law and National Electricity Rules, 2004, and Energy Market Reform Program – Key Achievements 2004, at www.mce.gov.
[39] COAG (2002), *Energy Market Review: Towards a Truly National and Efficient Energy Market,* December, Canberra, www.coag.gov.au.
[40] Clause 1.4, Australian Energy Market Agreement, 30 June 2004, COAG.
[41] Clause 5.1(a), AEMA 2004 as amended in 2006, Clause 5.1(b), AEMA 2004 as amended in 2006. See discussion in MCE Standing Committee of Officials, Legislative and Regulatory Framework, 2004, at 5-6.
[42] Ibid.
[43] Clause 5.1(b), AEMA, above n 39.
[44] See Standing Committee on Energy and Resources Communiqué, 11 December 2011, http://www.ret.gov.au/resources/Documents/mcmpr/SCER-Communique-9-Dec-2011.pdf
[45] The laws have been amended and/or replaced in accordance with the statutory provisions of the *National Electricity (South Australia) (New National Electricity Law) Amendment* Act 2005, which amended the existing National Electricity (South Australia) Act 1996.
[46] The 1996 Act came into force with the commencement of the NEM in December 1998.
[47] *National Electricity (South Australia) Act 1996*, Schedule 1, Parts 3–5. Note also that the current National Electricity Market Rules include the previous National Electricity Market Code, the initial national electricity rules and any rules made subsequently by the Australian Energy Market Commission: see current version of the *National Electricity (South Australia) Act 1996*, s 9, which provides that the Rules now have the force of law. See also National Electricity Rules, r 8 and the *Australian Energy Market Act 2004* (Cth), s 3.
[48] NEMMCO, *About the NEM*, 2008, www.nemmco.com.au/about/about.html.
[49] Section 49(3), NEL; Clause 2.1.1(ab) of the NE Rules.
[50] Part 6, National Energy Law, contained the Schedule to the amended National Electricity (South Australia) Act 1996.
[51] Part 7, National Energy Law, contained the Schedule to the amended National Electricity (South Australia) Act 1996.
[52] Part 8, National Energy Law, contained the Schedule to the amended National Electricity (South Australia) Act 1996. Furthermore, the *National Electricity (South Australia) (New National Electricity Law) Amendment* Act 2005 has effectively amended and repealed the various jurisdictional based laws, as well as the regulations made there under, replacing them with new instruments (laws, regulations and rules) that reflect and support the 2004 *Australian Energy Market Agreement* in each of the NEM's participating jurisdictions.
[53] NEL 2005, s 7. In passing, it is worth noting the absence of the environment as a long term concern of consumers. Although further discussion of this is outside the scope of this paper, this is somewhat curious, especially given the growing dilemma this is proving for governments and policy makers at domestic, regional

and international levels worldwide. Moreover, as ERIG has noted in its recent paper, a significant number of market participants have expressed concern over the issue of greenhouse gas emissions, in particular the risks associated with uncertainly surrounding future abatement initiative: see Energy Reform Implementation Group, Discussion Papers, November 2006, at 21-22, available at www.eri g.gov.au.

[54] NEL 2005, s 9.

[55] The *National Electricity (South Australia) Act* 1996 had been amended regularly since it first came into force in 1998. The most recent version of the Act, dated 1 January 2010, together with past versions, are available online at www.legislation.sa.gov.au.

[56] The *National Electricity Law* 1996 is set out in the Schedule 1 to the *National Electricity (South Australia) Act* 1996. Historical versions are available online at www.legislation.sa.gov.au.

[57] The new *National Electricity Law* is set out in the Schedule 1 to the to the amended *National Electricity (South Australia) Act* 1996. The most recent version of the Act, 1 January 2010, and the various amended versions since 1998, are available online at www.legislation.sa.gov.au.

[58] Pursuant to s 6 of the *National Electricity (South Australia) Act* 1996, above n 44, the Ministers of the participating jurisdictions of the NEM approved a code of conduct called the *National Electricity Code.* The National Electricity Code (1998-2005) was a registered industry access code under s 44ZZAA of the then TPA. It set out the market and code objectives together with the rights and responsibilities of market participants.

[59] These are under the auspices of the AEMC and can be found online at www.aemc.gov.au/Electricity/National-Electricity-Rules/Current-Rules.html

[60] The first version of the regulations came into force in 1998. A copy is available online at www.legislation.sa.gov.au

[61] The most recent version of the Regulations, 24 March 2011, is available online at www.legislation.sa.gov.au.

[62] Ibid.

[63] The *National Energy Retail Law (South Australia) 2011,* which is not yet in force at the time of writing this report is available online at www.legislation.sa.gov.au..

[64] The *National Energy Retail Law* is set out in the Schedule to the *National Energy Retail Law (South Australia) 2011.* Like the Act, the new Retail law is not yet in force at the time of writing this report.

[65] Not yet in force.

[66] Not yet in force.

[67] The Retail Policy Working Group and the Joint Implementation Group. See MCE official website for further information, www.m ce.gov.au.

[68] A further act has been passed, *Statutes Amendment (National Energy Retail Law)Act* 2011, which amends, inter alia, the *Australian Energy Market Commission Establishment Act* 2004, the *National Electricity (South Australia) Act* 1996.

[69] Australian Energy Regulator, www.aer.gov.au/content/index.phtml/itemId/730412.

PART 2

[70] R. Cantley-Smith, D. Bowman and G. Hodge, *Where is the Consumer? The Implications of Legislative & Regulatory Reforms in the National Electricity Market for Australian Consumers*, 2007,National Electricity Consumers Advocacy Panel, Sydney, Australia.

[71] NEL 2005, Section 29(2).

[72] NEL 2005, Section 32.

[73] NEL 2005, Section 31.

[74] See for e.g., RPWG, *National Framework for Distribution and Retail Regulation Working Paper 1,* November 2006, avail able at www.mce.gov.au. Submissions from various stakeholders and further information are also available at www.mce.gov.au.

[75] NEL 2005, s 8(2).

[76] For detailed information on this process see MCE website, www.mce.gov.au

[77] *Competition and Consumer Act 2010* (Cth), Part IIIA. .

[78] NEL 2005, s 16(1). See also ss 28F and 28V.

[79] NEL 2005, s 49 (3).

PART 3

[80] COAG, Towards a National Energy Policy, Communiqué and Attachments, Meeting of 8 June 2001, <www.coag.gov.au/coag_meeting_outcomes/2001-06-08/index.cfm#energy>.
[81] COAG, Towards a National Energy Policy, Communiqué, Meeting of 8 June 2001, at 2.
[82] Ibid*, Attachment 2*.
[83] Ibid, *Attachment 4*.
[84] COAG, *Towards A Truly National And Efficient Energy Market*, 2002, Commonwealth of Australia, Canberra, www.coag.gov.au.
[85] Ibid.
[86] Ibid., at 229-30. See also discussion in R Cantley-Smith, 'Demanding More: The Role of Demand Management and Improved End Use Efficiency in Australian Electricity Markets', J Cottrell, J E Milne, H Ashiabor, L A Kreiser and K Deketelaere (eds), *Critical Issues in Environmental Taxation*, Volume VI: International and Comparative Perspectives, 2009, Oxford University Press, United Kingdom and 'Greening the NEM: Environmental Managing Demand and Improved Energy Efficiency', in R Cantley-Smith and D Bowman (eds), Green Power: An Environmental Audit of the NEM , 2009, Research Publications Pty Ltd, Australia.
[87] Ministerial Council on Energy, *Reform of Energy Markets: Report to the Council of Australian Governments,* 11 December 2003.
[88] Department of Prime Minster and Cabinet, Securing Australia's Energy Future, 2004, and Securing Australia's Energy Future: July 2006 Update, Energy Task Force, Australian Government, Canberra.
[89] See R Garnaut, *The Garnaut Climate Change Review: Final Report*, 2008, Australian Government, Chapter 4, <www.climatechange.gov.au/greenpaper/report/pubs/greenpaper-ch4.pdf>.
[90] South Australia, *Parliamentary Debates*, House of Assembly, 9 February 2005, 1452 (Pat Conlon, Minister for Energy) and South Australia, *Parliamentary Debates*, House of Assembly, 27 September 2007, 964 (Pat Conlon, Minister for Energy).
[91] South Australia, *Parliamentary Debates*, House of Assembly, 9 February 2005, 1452 (Pat Conlon, Minister for Energy).
[92] Expert Panel on Energy Pricing Access, *Report to the MCE*, 2006, at 31.
[93] Ibid, at 37.
[94] South Australia, *Parliamentary Debates*, House of Assembly, 27 September 2007, 964 (Pat Conlon, Minister for Energy).
[95] G. Brody, 'Consumer Interest in the National Energy Market: A Changing Climate', in R. Cantley-Smith and D. Bowman (eds), *GreenPower: An Environmental Audit of the NEM,* 2009, Research Publications, Melbourne, at 35.
[96] R. Cantley-Smith, *A Policy of Confusion: The Changing Legislative and Regulatory Framework of the NEM*, forthcoming.
[97]. Ibid.
[98] South Australia, *Parliamentary Debates*, House of Assembly, 27 September 2007, 964 (Pat Conlon, Minister for Energy).
[99] *Electricity Industry Act 2000* (Vic), Div 6.
[100] See MCE official website at http://www.mce.gov.au/emr/rpwg/default.html.
[101] MCE, above n 21; See also Department of Resources, Energy and Tourism, at http://www.ret.gov.au/energy/efficiency/eeo/eeolegislation/act2006/Pages/default.aspx. See also discussion in R Cantley-Smith, 'Demanding More: The Role of Demand Management and Improved End Use Efficiency in Australian Electricity Markets', J Cottrell, J E Milne, H Ashiabor, L A Kreiser and K Deketelaere (eds), Critical Issues in Environmental Taxation, Volume VI: International and Comparative Perspectives, 2009, Oxford University Press, United Kingdom.
[102] Officer of the Renewable Energy Regulator, at http://www.orer.gov.au/about-the-schemes.
[103] Department of Climate Change and Energy Efficiency, at http://www.climatechange.gov.au/reporting
[104] See for e.g., Ministerial Council on Energy, *Reform of Energy Markets,* Report to COAG, 11 December 2003, at http://www.mce.gov.au; Energy Efficiency and Greenhouse Working Group, *Towards a National Framework for Energy Efficiency – Issues and challenges – Discussion Paper,* 2003, Department of Resources, Energy and Tourism, Australian Government, www.ret.gov.au/Documents/mce/energy-eff/nfee/_documents/ws_jonathan_cr.pdf; McDonell, G. (2005). *COAG's Quandry: What to do with the Energy Markets Reform Program? - A Review, Prepared for the Total Environment Centre and the Alternative*

Technology Association; McLennan Magasanik Associates. (2009). *Role of the NEM in Responding to Climate Change Policies, Report to Total Environment Centre*. See also the numerous publications by I. MacGill et al., Centre for Energy nad Environmental markets, University of NSW, online at http://www.ceem.unsw.edu.au/content/ElectricityIndustryRestructuring.cfm?ss=1

[105] Total Environment Centre, *Review of Demand-side Participation in the NEM, Stage III 'Power of Choice' Market Review,* 2011, Submission to the AEMC, at 7.

[106] Ofgem. nd. *The Gas and Electricity Markets Authority. Retrieved January 2011 from* www.ofgem.gov.uk/About%20us/Authority/Pages/TheAuthority.aspx

[107] US Federal Energy Regulatory Comission. (2011). *About FERC.* Retrieved 2011 14-April from http://www.ferc.gov/about/about.asp

[108] Canadian National Energy Board. (2011). *Strategic Plan.* Retrieved 2011 14-April from http://www.neb-one.gc.ca/clf-nsi/rthnb/whwrndrgvrnnc/strtgcpln-eng.html

[109] Moore, C. (2009 16-February). Response to Australian Energy Regulator on the NSW Draft Distrbution Pricing Determination 2009-2014. Sydney, NSW, Australia, p2

[110] MacGill, I. (2007 September). *The Australian National Electricity Market*, Presentation for EVN Training Program at UNSW; McDonell, G. (2005). *COAG's Quandry: What to do with the Energy Markets Reform Program? - A Review, Prepared for the Total Environment Centre and the Alternative Technology Association;* McLennan Magasanik Associates. (2009). *Role of the NEM in Responding to Climate Change Policies, Report to Total Environment Centre;* Outhred, H., & MacGill, I. (2006). Electricity Industry Restructuring for Efficiency and Sustainability - Lessons from the Australian Experience. *ACEEE Summer Study on Energy Efficiency in Buildings*.

[111] ACT Council of Social Service et al. (2007 May). Power for the People Declaration

PART 4

[112] AEMO, nd, Operating Procedures. Accessed August 2011 http://www.aemo.com.au/electricityops/operating_procedures.html

[113]AEMC, 2010, Annual Market Performance Review 2009-10

[114] Ibid, at p84

[115] AER, 2010, State of the Energy Market

[116]Op cit 113, at p63

[117] AER, 2010, State of the Energy Market, at 58; AEMC, 2010, Annual Market Performance Review 2009-10, at p63

[118] Redundancy refers to duplication of infrastructure i.e. if one network connection fails, there is another to do the work.

[119] AER, 2010, State of the Energy Market, at p58

[120] Ibid. Note: data used for years 2005 – 2009: The data reflect total outages experienced by distribution customers, including outages resulting from issues in the generation and transmission sectors. In general, the data have not been normalised to exclude outages beyond the network operator's reasonable control. Some data have been adjusted to remove the impact of natural disasters (for example, Cyclone Larry in Queensland and extreme storm activity in New South Wales), which would otherwise have severely distorted the data.

[121] ESAA, 2010, Electricity Gas Australia. Note: Interruptions caused by all factors, including natural disasters, transmission failures and third-party induced interruptions. Includes distribution and transmission losses.

[122] AER, 2010, State of the Energy Market; ESAA, 2011, Electricity Gas Australia

[123] CEER, 2008, 4th Benchmarking Report on Quality of Electricity Supply at 127

[124] Ibid; KEMA consulting, 2006, Quality of supply and market regulation survey within Europe

[125] CEER, 2008, 4th Benchmarking Report on Quality of Electricity Supply p.33

[126] Op cit 123

[127] AEMC Reliability Panel 2007, *Comprehensive Reliability Review*, Final Report, December 2007, Sydney, at 105; AER, 2010, *State of the Energy Market*., at 38; AEMC Reliability Panel 2010a, *Reliability Standard and Reliability Settings Review*, *Final Report*, 30 April 2010, Sydney

[128] AER, 2010, *State of the Energy Market*, at 41

[129] AEMC 2010, *Review of the Effectiveness of NEM Security and Reliability Arrangements in light of Extreme Weather Events, Final Report*, 31 May 2010, Sydney, p 54

[130] AER, 2010, State of the Energy Market

[131] Reliability events are caused by a lack of capacity due to power system equipment reaching operational limits and generally occur when reserve capacity in the system has been exhausted (AEMC 2010, *Review of the Effectiveness of NEM Security and Reliability Arrangements in light of Extreme Weather Events, Final Report*, 31 May 2010, Sydney p.i)

[132] Op cit 129, at p53

[133] Ibid, at p8

[134] Ibid, at p56,

[135] Security events are generally those caused by a rapid disconnection of power system equipment from service due to either equipment failure or the activation of protection systems (AEMC 2010, *Review of the Effectiveness of NEM Security and Reliability Arrangements in light of Extreme Weather Events, Final Report*, 31 May 2010, Sydney p.8). Security is the product of the technical performance characteristics of plant and equipment connected to the power system and how the Australian Energy Market Operator (AEMO) and network service providers operate it (AEMC Reliability Panel 2010, *Annual Market Performance Review, Final Report*, 23 December 2010, Sydney, p.20).

[136] This suggests improvements to the quality of consumer electricity supply through generation and transmission would be most effectively achieved through measures to reduce the incidence of security events (AEMC 2010, *Review of the Effectiveness of NEM Security and Reliability Arrangements in light of Extreme Weather Events, Final Report*, 31 May 2010, Sydney p.16).

[137] Op cit 129, at p54

[138] AEMC Reliability Panel 2010, *Annual Market Performance Review, Final Report*, 23 December 2010, Sydney, at p21

[139] Parsons Brinckerhoff, 2009, Energy Regulatory and Market Development Forum, Security and Reliability of Electricity Networks. For the Asia Pacific Partnership on Clean Energy Development and Climate. P27 http://www.ret.gov.au/Documents/app/_documents/FINAL_Reliability%20%20Security%20Review%20(6%20Apr%2009).pdf

[140] Prior to publication of the Comprehensive Reliability Review (CRR) in 2007, load shedding due to industrial action was included in calculations of USE, which resulted in South Australia and Victoria falling outside the Reliability Standard in 2000. Following the publication of the CRR, the scope of the Reliability Standard was amended to exclude USE associated with "power system incidents that results from industrial actions or 'acts of God' at existing generating or inter-regional transmission facilities" When USE resulting from the industrial action in South Australia and Victoria in 1999/2000 and 2000/2001 financial years is excluded, recalculated USE values for the past ten financial years for South Australia (0.00051%) and Victoria (0.00044%) remain within the Reliability Standard (AEMC Reliability Panel 2010, *Reliability Standard and Reliability Settings Review*, *Final Report*, 30 April 2010, Sydney, at 11).

[141] Op cit 115, at p42

[142] Op cit 129, at p56

[143] Op cit 129, at p55

[144] Ibid, .56

[145] Ibid, at 20

[146] AEMC Reliability Panel 2007, *Comprehensive Reliability Review*, Final Report, December 2007, Sydney, at 23

[147] Op cit 22, at v.

[148] AEMC Reliability Panel 2010a, *Reliability Standard and Reliability Settings Review*, *Final Report*, 30 April 2010, Sydney, at viii.

[149] Ibid

[150] AEMC Reliability Panel 2007, *Comprehensive Reliability Review*, Final Report, December 2007, Sydney p.14

[151] should be: AEMO, nd, Operating Procedures. Accessed August 2011 at http://www.aemo.com.au/electricityops/operating_procedures.html

[152] AEMC 2010, *Review of the Effectiveness of NEM Security and Reliability Arrangements in light of Extreme Weather Events, Final Report*, 31 May 2010, Sydney, at 8

[153] AEMC Reliability Panel 2010, *Annual Market Performance Review, Final Report*, 23 December 2010, Sydney, p. 20

[154] National Electricity Rules, Version 45, clause 4.3.1 at 295

[155] The technical envelope means the technical boundary limits of the power system for achieving and maintaining the secure operating state of the power system for a given demand and power system scenario (NER, Version 45 at 293).
[156] National Electricity Rules, Version 45, clause 4.2.4 at 293
[157] AEMC Reliability Panel 2007, *Comprehensive Reliability Review*, Final Report, December 2007, Sydney, at 23
[158] AEMC 2010, *Review of the Effectiveness of NEM Security and Reliability Arrangements in light of Extreme Weather Events, Final Report*, 31 May 2010, Sydney Appendix F)
[159] Ibid
[160] Essential Services Commission, Victoria (2006) Electricity Distribution Price Review 2006 Service Incentive Arrangements Consultation Paper No. 2 p.9
[161] ENA (2008) *Customer Guide to Electricity Supply*, August 2008 p.5
http://www.ena.asn.au/udocs/2010/11/ENA-Customer-Guide-to-Electricity-Supply1.pdf
[162] ENA (2008) Customer Guide to Electricity Supply, August 2008 p.30
http://www.ena.asn.au/udocs/2010/11/ENA-Customer-Guide-to-Electricity-Supply1.pdf
[163] AEMO (2011) Value Of Customer Reliability Issues Paper. Version 1.3 p.10
http://www.aemo.com.au/planning/0400-0032.pdf
[164] ENA (2008) Customer Guide to Electricity Supply, August 2008 p.6
http://www.ena.asn.au/udocs/2010/11/ENA-Customer-Guide-to-Electricity-Supply1.pdf
[165] Elphick, S., Smith, V., Gosbell, V., Barr, R., Integral Energy Power Quality & Reliability Centre, Univ. of Wollongong, Wollongong, NSW, Australia. (2010) *The Australian Long Term Power Quality Survey project update*. Harmonics and Quality of Power (ICHQP), 2010 14th International Conference p.1
[166] Op cit 46
[167] Op cit 46
[168] Ausgrid (2011) Network Performance Report 2010/2011 p.19 http://www.ausgrid.com.au/Common/Our-network/Network-regulation-and-reports/~/media/Files/Network/Regulations%20and%20Reports/AusgridFinalNetworkPerformanceReport201011.pdf
[169] Elphick, S., Gosbell, V., Barr, R., Integral Energy Power Quality & Reliability Centre, Univ. of Wollongong, Wollongong, NSW, Australia (2008) *The Australian Long Term Power Quality Monitoring Project*. Harmonics and Quality of Power, 2008. ICHQP 2008. 13th International Conference p.4
[170] Electricity Network Performance Reports, 2009/10, Country Energy, Transgrid, Energy Australia and Integral Energy.
[171] Industry and Investment NSW (2010) *Electricity Network Performance Report New South Wales: Annual Report Outline,* State of NSW, Sydney.
[172] ESAA (2007) *Energy Gas Australia 2007*, Electricity Supply Association of Australia, Melbourne; ESAA (2008) *Energy Gas Australia 2008*, Electricity Supply Association of Australia, Melbourne; ESAA (2009) *Energy Gas Australia 2009*, Electricity Supply Association of Australia, Melbourne; ESAA (2010) *Energy Gas Australia 2010*, Electricity Supply Association of Australia, Melbourne; ESAA (2011) *Energy Gas Australia 2011*, Electricity Supply Association of Australia, Melbourne.
[173] Ibid.
[174] Garnaut Climate Change Review, 2008, 'Transforming Energy', *Garnaut Climate Change Review: Final Report* at 469.
[175] Taken from AEMC (2010) *Future Possible Retail Electricity Price Movements: 1 July 2010 to 30 June*
[176] Derived from state by state customer number data from ESAA (2010) (Op cit 44) and residential retail price data from AEMC (2011) (Op cit 47).
[177] Note this does not include standing charges.
[178] AEMC (2010) *Future Possible Retail Electricity Price Movements: 1 July 2010 to 30 June*
[179] ESAA (2011) Energy Gas Australia 2011, Electricity Supply Association of Australia, Melbourne; KPMG (2010) Energy Price Forecasts Spreadsheet (no-CPRS), part of KPMG report to AEMO. Accessed February 2010, at www.aemo.com.au/planning/esoo2010.html; and Op cit 47
[180] Calculated in 2009/102008/09$ from ESAA historical price data

[181] Derived from ESAA (2010) *Energy Gas Australia 2010*, Electricity Supply Association of Australia, Melbourne; and Op cit 178

[182] IEA (2010) *Electricity Information 2010*, International Energy Agency, Paris, France; ESAA (n.d.) *Historical Electricity Price Data;* and Op cit 178

[183] Rademaekers, K., Slingenberg, Al. and Morsy, S. (2008) *Review and analysis of EU wholesale energy markets.* Report by ECORYS Nederland BV to the European Commission DG TREN. Accessed at http://ec.europa.eu/energy/gas_electricity/studies/doc/2008_eu_wholesale_energy_market_historical.pdf

[184] IEA (2010) *Electricity Information 2010*, International Energy Agency, Paris, France; and Op cit 47

[185] Ibid

[186] ESAA (2011) Energy Gas Australia 2011, Electricity Supply Association of Australia, Melbourne; KPMG (2010) Energy Price Forecasts Spreadsheet (no-CPRS), part of KPMG report to AEMO. Accessed February 2010, at www.aemo.com.au/planning/esoo2010.html; and ESAA (n.d.) *Historical Electricity Price Data*

[187] Derived from KPMG (2010) Energy Price Forecasts Spreadsheet (no-CPRS), part of KPMG report to AEMO. Accessed February 2010, at www.aemo.com.au/planning/esoo2010.html

[188] Note that industry electricity prices are the only business prices reported on internationally

[189] IEA (2010) *Electricity Information 2010*, International Energy Agency, Paris, France; ESAA (n.d.) *Historical Electricity Price Data.* Note: Australian NEM data is based on business prices including both commercial and industrial

[190] OTTER (2011) *Electricity Pricing – Information Sheet;* OTTER (2010) C*omparison of 2010 Australian Standing Offer Energy Prices;* OTTER (2009) C*omparison of 2010 Australian Standing Offer Energy Prices;* OTTER (2008) C*omparison of 2010 Australian Standing Offer Energy Prices.* Note: 2008/09 data is actually for the 2008 calendar year

[191] Note: where a range was given by OTTER a midpoint was taken

[192] Weighted using total business customer numbers from Op cit 172

[193] Op cit 190; ABS (2011) *Consumer Price Index, Australia,* Bureau of Statistics, Canberra; and ABS (2011a) *Producer Price Indexes, Australia,* Australian Bureau of Statistics, Canberra. Accessed August 2011 at

[194] AEMO (2011) *Electricity Statement of Opportunities for the National Electricity Market,* Melbourne, p3-9

[195] Ibid

[196] ABS (2006) *Household Expenditure Survey 2003/04 (Reissue),* Canberra; ABS (2011) *Household Expenditure Survey 2009/10,* Canberra.

[197] Eurostat (2010) *Consumption expenditure per household with expenditure greater than zero – Electricity,* European Commission; Eurostat (2010) *Household income, with income greater than zero,* European Commission.

[198] Ibid; ABS (2011) *Household Expenditure Survey 2009/10,* Canberra.

[199] UK Parliament. (2011 7-February). HC 742 Electricity Market Reform – Additional memorandum submitted by Ofgem (EMR 22B). Retrieved 2011 8-April from http://www.publications.parliament.uk/pa/cm201011/cmselect/cmenergy/writev/742/emr22b.htm

[200] Percentages are based on comments from the 12 respondents who made suggestions based on the open ended question: "What other criteria should be used to evaluate the NEM"

[201] Commonwealth of Australia. (2006). *Australian Energy Market Agreement (As Amended).* Retrieved 2011 14-April from http://www.ret.gov.au/Documents/mce/_documents/AmendedAEMA_Signature_and_Text20060619141403.pdf

[202] Department of Climate Change and Energy Efficiency. (2011). *Australian National Greenhouse Accounts - National Inventory Report 2009 Volume 1.* Canberra; Department of Climate Change and Energy Efficiency. (2011). *Australia's Natoinal Greenhouse Gas Accounts - State and Territory Greenhouse Gas Inventories 2009.* Canberra. Calculated by estimating and discounting the contribution of other energy industries by state over time

[203] Ibid

[204] Ibid

[205] This 5% target does not require that emissions reductions occur domestically, but this report assumes that we reduce our own emissions rather than just purchasing 'reductions' from overseas.

[206] Commonwealth of Australia. (2011). *Securing a Clean Energy Future: The Australian Government's Climate Change Plan.* Canberra.

[207] This follows on from earlier commitments to international agreements such as the Kyoto Protocol (United Nations, 1998) whereby Australia committed to an increase of 8% on 1990 emission levels by the average of 2008 to 2012. Earlier non-binding targets were even more aggressive for example with Australia committing to a stabilisation of GHGs at 1990 levels by 2000 as part of the United Nations Framework Convention on Climate Change signed at the UNCED Earth Summit in Rio de Janeiro in June 1992 (United Nations, 1992).
[208] Note that this is a much higher (easier to achieve) annual rate of change target than the Kyoto Target commitments which only allowed for an average increase of 0.39% per annum.
[209] Garnaut, R. (2011). *The Garnaut Review 2011, Australia in the Global Response to Climate Change;* Chapter 11
[210] Op cit 202
[211] Note that even without brown coal, Australia would still likely have one of the highest emission intensities from power generation in the OECD.
[212] Calculated from AEMO and Department of Climate Change and Energy Efficiency figures
[213] International Energy Agency. (2010). CO2 Emissions from Fuel Combustion - Highlights.
[214] Calculated from SKM MMA. (2011). *Projections of Greenhouse Gas Emissions for the Stationary Energy Sector .* Melbourne. Using an estimated loss factor of 6%
[215] Garnaut, R. (2011). *The Garnaut Review 2011, Australia in the Global Response to Climate Change.*
[216] The concept of contraction and convergence was first legitimised with a statement drafted in 1990 - GCI. (1991 June-18). *Contraction and Convergence*. Retrieved 2011 19-Sep from Published in the Guardian: http://www.gci.org.uk/Documents/OrigStatement2.pdf
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